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THE
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THE REGIONS OF MIXED POPULATIONS IN NORTHERN ITALY*

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[With separate map, Pl. III, facing p. 144.]

Medieval Colonization of the Alps and the Present Ethnography of Northern Italy

ETHNIC UNIFORMITY OF THE PO VALLEY

It is strange that the Po Valley should be linguistically so uniform, in view of the repeated barbarian invasions to which it has been subjected. From its western extremity at the base of the Alps in Piedmont to its easternmost limit, where it joins the slopes of the Carso near Monfalcone, it is inhabited by a population which, except for slight anthropological differences and dialectal variations, shows how the language and civilization of Rome unified races of divers origins. After the Gallo-Italian dialects, such as those of Piedmont, Lombardy, and Emilia, come those of Venetia and Friuli; yet they are all dialects of Italian and are dominated by Italian as a language of culture. The only traces remaining of medieval foreign occupation are to be found in the place names; and even these are scattered and insignificant, with the exception of a well-localized group of Slavic names in the plain of Friuli west of Udine. Except for this latter region, which furnished the highroad for the foreign invasions, the great Po Valley, even in the centuries of Italy's greatest depopulation, possessed enough civilized inhabitants to assimilate the people who came from outside, often in great masses but always without sufficient support from new arrivals. The valley might be held for centuries by foreign peoples, but they were always sure to be more or less rapidly fused with the native population.

*Translated by President W. W. Comfort of Haverford College, Haverford, Pa., from the Italian original written for the *Geographical Review*.

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The Alpine Peoples

Very different, however, were the vicissitudes of the Alpine district which flanks the Po Valley. Here natural conditions prevent a dense population and an uninterrupted settlement. The thickly populated districts are confined to the valley bottoms and to the slopes with favorable exposure.

The Alpine peoples, of whatever origin, may have been able partly to escape from Celtic influence but not from that of Rome. In antiquity they, like the peoples of the plain, were almost completely Latinized. There is evidence of this in the series of Alpine dialects which with slight interruption extends from the Grisons to Friuli—dialects differing among themselves but regarded by linguistic experts as constituting a single group called "Ladin." Some of these peoples call themselves "Ladins," while others call themselves "Romansh"; both terms are reminiscent of the civilization of Rome and at the same time are living indications of its confines. Today, however, these confines are no longer what they once were. The place names show that the Ladin territory included a great part of eastern Switzerland and of the Tyrol, Vorarlberg, a great part of Bavaria, Salzburg, the Pustertal, and other territory which is now German. It used to include also the Julian Alps, now in great part Slav.

It appears certain that the population of the Alps, already sparse in ancient times, became still more sparse during the early Middle Ages, whereas the Germanic and Slavic peoples experienced that great increase which was the indirect cause of the violent migrations toward the Mediterranean countries and of those slower and more continuous movements of expansion by which their present distribution in Europe is chiefly explained.

Medieval Colonization of the Alps

Almost all the great barbarian invasions were directed at the regions of Italy which were richest in treasures accumulated through the ages. The Alps could only prove a temporary resting place for peoples who were seeking passage by the easiest and most accessible routes. So these invasions had no direct influence upon the ethnography of the Alpine territory but only an indirect influence due to the havoc they wrought along their path. Of far greater importance were the varied colonizing movements which took place in the wake of the great barbarian invasions for centuries. This colonization was accomplished by groups that were numerically small but were often renewed during the long periods of time involved; they found the conditions favorable for a secure settlement in the midst of the sparse Alpine population. These movements lasted until the thirteenth and fourteenth centuries, and in some cases even longer. They were often favored by feudal lords who desired to populate abandoned territories and who were unscrupulous about the people among whom they recruited colonists.

German Colonization

It is well known that in the Middle Ages the Alps were less a country of feudal castles than of hospices and convents. Even before any conception of nationality was developed, the abbots and bishops were the natural upholders of the Roman element, while the dukes, counts, and marquises—almost all of German origin—were certain to favor the German element. Nevertheless, in many of the ecclesiastical estates German colonization proceeded without hindrance and in some cases with encouragement. This is explained in part by the fact that the Italian element had no settlers to furnish, and in part by the fact that the Germans alone possessed the knowledge of some special craft, such as that of mining. At the eastern end of the Alps the Franks granted lands in the plain of the Tagliamento to the Slavs, while later the Patriarchs of Aquileia admitted to their territory groups of German settlers. All this shows that we are dealing here with phenomena explained by geographic, economic, and social factors which were more weighty than the desires of the governors.

In several particulars the German colonization of the Alps differed from that of the Slavs, among others in the greater rôle played by agriculture and various arts and trades as compared with stock-raising, and because in general it was later and continued longer; there were, too, some territories in which the Germans came and settled in Slav colonies.

Slav Colonization

The movement of the Slavs toward the west began at the end of the sixth century and was arrested by the Bavarians in the Pustertal and by the Lombards in Friuli. But these combats were probably against the first bands of robbers, behind which came the peaceful stream of colonists, not numerous, but sufficient to populate completely Styria, Carinthia, Carniola, and parts of Friuli and Istria. The Italian element with which they came into contact in the latter regions showed a remarkable power to assimilate the Slavs. But only in a few cases could it offer an effective resistance. A considerable resistance was offered, however, by the German element, especially in Carinthia. In the eighth century the German colonists had begun to establish themselves in force among the Slavs, who were evidently much scattered, so that Carinthia and northern Styria were already in the twelfth century largely populated by Germans or Germanized Slavs, as were also later central Styria and the greater part of the basin of Klagenfurt. This diffusion of the Germans over territory once Romanized and later become Slav took place on the southern side of the Alpine watershed only in a few cases, as in the upper valley of the Fella (at the source of this river and at Pontafel) and in the basin of the Isonzo, where, however, the little colony of Deutschrut, imported by the Patriarchs of Aquileia in the fourteenth century, has now become Slovene.

Non-Coincidence of Alpine Watershed with Ethnic Boundary

There have been many cases on the other hand in which German colonization passed beyond the Alpine watershed, pouring directly into Italian territory. The most notable is certainly that of the upper Adige region; but from the Monte Rosa massif to the Carnic Alps there is a whole series of German peninsulas and islands in Italian territory. On the other hand, around the upper Rhine and the upper Inn (Engadine) the Ladin element is still found on the northern slope of the Alps. Thus, when the line of the Alpine watershed is considered in relation to the limit between the German and Italian peoples, it is easy to see that a coincidence is quite exceptional. It is evident also that the medieval colonization of the Germans followed sometimes the highroads from the trans-Alpine countries into Italy and sometimes secondary paths and difficult passes; wherefore it is not always easy to see a close relationship between the topography of the Alps and its ethnographic conditions.

The Territories of Mixed Populations

Location between Political Boundary of Italy and Alpine Watershed

We must now examine separately each of the territories with a mixed population. They are almost all outside of the political state of Italy, the greater part of them lying between the boundaries of the kingdom and the Alpine watershed. Since this watershed is conventionally regarded as the natural boundary of Italy, these territories are generally considered as outskirts of Italy under foreign rule. To some of them Italian geographers have given special names which differ from their official or political names and sometimes even from their traditional names. "Venezia Giulia" (Julian Venetia), for example, has been used by Italians for some decades to designate the region which the Austrian government calls the Küstenland, together with parts of Carinthia, Carniola, and Croatia. The southern part of the Tyrol south of the watershed, on the other hand, is called the "Trentino" (i. e. the Trent district), a comparatively old name, and the northern part "Alto Adige" (i. e. the basin of the Adige above Salorno), a name only recently used, at least in its present acceptation. The terms "Italian Switzerland" or "Swiss Lombardy" and the name "Nizzardo" (i. e. the district about Nice) have no need of special explanation. Almost none of the regions here mentioned has any geographic unity, since their extent is dependent on the often irrational position of the political boundary of Italy in relation to its so-called natural boundary. Most of these districts result from an aggregate of diversified territories or parts of territories which often have had no common history and have now no administrative unity.

Extension of Trans-Alpine States to Italian Territory Facilitated by Ease of Crossing Alpine Watershed and Carso

Almost all are territories conquered at the expense of Italy, when for centuries it was divided and weak. These conquests usually find their geographical reason in the interest which the Alpine or partially Alpine states had in securing for themselves the possession of the roads which led down into the Po Valley by occupying the passes and southern Alpine valleys. The states in the Po Valley—strong because they were rich in population and civilization—were the states which, although usually at war among themselves, saved Italy from total subjection to the foreigner and later rendered possible its unity. The extension of the trans-Alpine states to Italian territory was facilitated by the fact that the Alps are not everywhere a difficult obstacle and that their divide is not everywhere clearly defined. The line is most undecided at the eastern extremity of the Alpine chain, in the Carso, where most of the watercourses flow partly underground and where none of the various relief features have a decided character. The Carso, indeed, presented serious difficulties to railroad construction, though not requiring long tunnels, but it always offered easy access to the old forms of transportation and to great masses of migratory peoples. The population which established itself in the Carso did not feel that isolating influence exercised in the Alps by the high mountain barriers separating one valley from another. Moreover, even in the more rugged parts of the Carso the anthropogeographical conditions in some respects approach the conditions in the plains, while in other respects they are distinctive.

It is precisely in the region of the Carso that the occupation of Italian territory by foreign peoples has reached its widest extension. Here, in Julian Venetia, we find the greatest aggregation of diversified territories and the greatest ethnic complications.

Istria

Julian Venetia in General

Julian Venetia includes, besides a part of Carniola and a smaller part of Croatia, the upper Fella valley, the Gorizia district (i. e. the County of Gorizia and Gradisca), Trieste, Istria, and Fiume. The upper Fella valley was never under the rule of an Italian state; the County of Gorizia, after the extinction of its ruling house, which was feudally dependent first on the Patriarchs of Aquileia and then on Venice, passed in 1500 by inheritance to the House of Austria and has belonged to it ever since; inland Istria, for similar reasons, had previously undergone the same fate, while the seacoast belonged to the Republic of Venice until the Treaty of Campoformio (1797); Trieste in 1382 placed itself beneath the protection of the Dukes of Austria in order to have their support against Venice;

Fiume in 1483 through inheritance came under the same dominion, but in 1778 was handed over to the Hungarian Crown. Julian Venetia includes Alpine territory (the Julian Alps), foothills (Julian Pre-Alps), plateaus (the high Carso) and high plains, and a piece also of real plain (eastern Friuli). It cannot be considered in its entirety, but only in the separate parts into which it is traditionally divided.

Italian Character of Istria

Istria is the most notable part of Julian Venetia. Administratively it includes the islands of the Quarnero (Veglia, Cherso, and Lussin) and excludes Trieste and Fiume. The islands of the Quarnero can be considered as belonging physically to the archipelago of Dalmatia, while Istria finds its physical unity mainly in its peninsular character. Istria resembles a typically Italian region both in its physical features and in the human occupation of its soil, especially its arboriculture. An even stronger impression of being in Italy is made upon the visitor by its cities, both by their monuments and the general appearance of their buildings. Art and culture are everywhere entirely Italian.

Ethnic History

However, the ethnographic conditions of Istria are complicated. In few regions could there be found a more mixed population. The whole peninsula was Romanized in antiquity, with the result that there became established, in the north, upon a Carnic foundation, a Ladin dialect, which has only recently disappeared, and, in the south, upon an Illyrian foundation, a Venetian dialect, the Istrian of today. In the seventh century there arrived from the north the Slovenes and, a little later, from the east, the Croats. They were chiefly shepherds and only later became tillers of the soil. The Italian population of the cities, located mainly on the coast, maintained itself almost everywhere and in a great part of the region was strengthened by the rule and civilizing influence of Venice. But for various economic and social reasons Istria, in the fourteenth and following centuries, underwent a depopulation. To repair this the Republic of Venice favored colonization by outside peoples, principally from Dalmatia and Albania. The ethnography of Istria is, in large measure, the product of this immigration, which took place in the fifteenth, sixteenth, and seventeenth centuries, and which was directed both toward the inland districts and to those parts of the seacoast remaining unpopulated. The last of these colonies (1657) is that of Peroi, near Pola, settled by people from the Bocche di Cattaro region and by Montenegrins, who still preserve their Greco-Oriental religion. This colonization, which continued more than two centuries, strengthened the Slav element in the interior and introduced it in the Italian cities of the west coast. It also brought Rumanians, the greater part of whom, however, are now Slavicized, their original language

being preserved by only a few hundred people in two small districts in Croatian territory. The Slavicized Rumanians are the so-called Ciccì (Chichis), who inhabit the most mountainous part of Istria, the Fucki, and perhaps some other stray element, which, in the past, fused with the Italian. It is worthy of remark, however, not only that many of the Slavs of Istria use Italian as their language of culture and commerce, but also that some hybrid dialects have been formed, as is the case with the so-called Schiavetto.

Present Ethnic Conditions

The last century brought, on the one hand, the strengthening of the Italian element in the coast cities, thanks to the assimilation of the uneducated Slavs and to the immigration of laborers from Friuli, and, on the other, the extension and consolidation of the Slavic element in the country and in the interior. The latter phenomenon may be due to the greater fecundity of the Slavs, their absorption of the Rumanian elements, or their increased spirit of nationality, as a result of which some bilingual populations which in the past considered themselves as Italians today regard themselves as Croats. Later, in the interior of the peninsula, which did not belong to Venice, there was added the German element, which during the feudal period had difficulty in securing a foothold. In very recent times it has become somewhat numerous in a few seaside and winter resorts such as Brioni and Abbazia and at Pola. From being a small town, which a century ago numbered less than 1,000 inhabitants, Pola has become the largest city of Istria, with 60,000 inhabitants, since its transformation into the chief naval port of Austria-Hungary. The other coast cities of Istria had little modern industrial and commercial development. This enabled them to preserve their Italian character intact, in their architecture and their language as well as in all the manifestations of family, civil, and artistic life.

It is difficult to determine with certainty the distribution of the population of Istria according to language, even within its administrative limits (4,956 sq. km.). This is due to the difficulty of classifying mixed or bilingual peoples and to the frequent unreliability of the statistics collected in a region occupied by hostile nationalities. In the census of 1910 the Italians numbered 147,388, the Serbo-Croats 167,966, the Slovenes 55,407, the Germans 13,279, the Rumanians 883. But these figures include only Austrian subjects; thus the 147,388 Italians rise to 153,415 if we add the 6,027 citizens of the kingdom of Italy who inhabit Istria. On the other hand, the number of Germans would be reduced to less than a third if we excluded the garrison of Pola. These figures show, in any case, that in Istria no nationality predominates in a marked degree. It is, however, to be noticed, that in agriculture and economic activity the Italians have an importance out of all proportion to their numbers, so much so that a great many of the Slavs speak Italian.

Trieste and Fiume

As Economic Outlets of a Large Hinterland

Trieste and Fiume do not form a part of Istria either geographically or politically. Trieste has administrative autonomy in Austria and Fiume in Hungary. The small territory included in these divisions—95 square kilometers for Trieste and 21 square kilometers for Fiume—is in contrast with the size of their present economic *hinterland*, but it finds an explanation in the conditions of the past, which have their basis in the geographical position of the two cities. Trieste is not at the mouth of a valley, while Fiume is at the mouth of a valley of rather limited length and has behind it the Carso, which is here more impassable than at Trieste. The two cities were for centuries Adriatic ports, much like those of Istria in importance and presenting similar conditions of development. These two cities, as long as they mainly lived from the sea and in the days of small industries, sailing ships, and the old methods of land transportation, developed their economic activity within very narrow lines, which often did not pass beyond the bounds of their own hydrographic basin. So they had a limited importance. Nevertheless their Italianism, although scarcely felt in a nationalistic sense, was in no danger of extinction, because life on the shores of the Adriatic, which is so completely an Italian sea, could not but be strengthened by it. But in modern times these two ports became the outlets of large territories in the interior of Europe, extending far beyond the Danube. The two cities grew rapidly through the influx of inhabitants from near at hand, prevailingly Slavs, and from the more remote regions, Germans in the case of Trieste, and Hungarians of Fiume. To the natural development of this phenomenon we must add in the last decades the policy of the governments of Austria and Hungary, which was directed not only to developing these outlet ports but also to rendering less dangerous the singular state of affairs involved in the fact that the chief port of a state in which the German element dominates is in reality Italian and accessible only across more than a hundred kilometers of Slovene territory and that the chief port of the other state, in which the Magyar element is supreme, is also Italian and accessible only across two hundred kilometers of exclusively Croatian territory. This policy has contributed to diminishing, though in slight measure, the relative numerical importance of the Italian element in the two cities; but it greatly helped to give these Italians a strong sense of their nationality and to make Trieste the chief center of "irredentism"—that is, of the movement for the political reunion of the "unredeemed" districts with the Italian fatherland.

Size of the Population According to Nationalities

Only in the eighteenth century, and especially in the second half of it, did Trieste surpass in population the other cities of Istria—Fiume only

in the nineteenth; but, except during the last twenty years, the growth of the two cities, despite the great prevailing influx of Slavs, was always less than the power of assimilation of the more intelligent native element. For instance, the 120,000 Italians in Trieste according to the census of 1910 doubtless cannot be regarded as descendants of the few thousand who lived there in the first half of the eighteenth century (3,865 in 1735). A large percentage of the population of Trieste, as is shown by the family names, is of Slav or German origin; another large number is due to the not inconsiderable immigration from Friuli or Venice. This influx, like that of the Slovenes, is explained by the modern industrial development of the city. In 1910, besides the 120,000 subjects of Austria, there were in Trieste almost 30,000 Italian citizens. Out of the 220,000 inhabitants of the city, the Italians represented three-fourths of the population, so that the 60,000 Slovenes, who live chiefly in the suburbs, and to a still greater extent the 12,000 Germans, represented minorities only. At Fiume in 1910 the Italians, including those born in Italy, represented little more than one-half of the population, which numbered about 50,000; yet even numerically they formed the dominant element, as compared with 15,000 Slavs and 6,500 Magyars. It is in the presence of these newcomers that the people of Trieste and Fiume felt their allegiance to Italy all the more, though at first but weakly; but in Istria this allegiance has always been deeply felt, if only in the form of devoted attachment to Venice.

The Gorizia District

The County of Gorizia

The old County of Gorizia represents a fragment of Friuli which a feudal family in the Middle Ages succeeded in detaching from it and which, as we have seen, later passed to the House of Habsburg. Under the name of County of Gorizia and Gradisca it forms a province by itself. It includes, besides a piece of the Carso behind Trieste and the valley of the Vippacco (German, Wippach), which separates the Carso proper from the high Carso (the plateau of Ternova), two principal geographic regions: the valley of the Isonzo and the eastern part of the plain of Friuli. The limits of this province towards the kingdom of Italy are most unnatural; the most unnatural section of the boundary is that which runs through the plain and which is for the greater part defined by the little river Judrio. This was the limit of Venetian Lombardy as long as this region belonged to Austria, and it represented a rectification of a still more complicated boundary which for centuries limited the Republic of Venice on the east. On both sides of this frontier are to be found not only the same physical and economic conditions, but also the same Italian population, which extends compactly to the foot of the Carso. Here there is no question of a mixed population as in Istria, because the separation between the Italian

plain and the Slovene mountain district is almost everywhere clean-cut. As was shown above, the Slavs had also established themselves in some parts of the plain of Friuli, but here the Italian population quickly regained the lost territory, and for centuries the ethnographic has coincided with the geographic boundary. Rather than a mixed zone, there could be distinguished one in which the Slavs, who were in close relations with the Italian centers at the foot of the mountains, were compelled to speak, beside their own dialect, that of Friuli.

The City of Gorizia

Gorizia, which was always the political center of the entire territory, has always formed an exception. But ever since the commercial activity of the town in the plain began to prevail over the court life in its feudal stronghold, the city has been almost exclusively Italian in population and character. Recently, however, the development of the city, and especially its suburbs, as a great industrial center has brought about a profound change inasmuch as the workers have been recruited chiefly among the Slovenes. Thus the census of 1910 showed that the population was only half Italian: as against 14,838 Italians (to whom must be added 1,110 subjects of Italy) there were 10,782 Slovenes and 3,236 Germans. These last, when they do not belong to the garrison, are there because Gorizia is a favorite resort of Austrian state pensioners and of persons desiring or requiring a mild climate. (Though with evident exaggeration, Gorizia is often called the Austrian Nice.)

Population of the County

Within the confines of the County of Gorizia and Gradisca (2,918 sq. km.) the census of 1910 showed 90,181 Italians (Friulians and, at Monfalcone, Venetians), to which must be added 8,947 Italians born in Italy, while there were 154,537 Slovenes and 4,481 Germans.

The Slovenes of the Province of Udine and the Resians

It must be noted here that the Slovene area of the County of Gorizia, while it continues on one side into Carniola and into Carinthia, on the other side includes, in the province of Udine, a territory consisting in large part of valleys which send their waters into the Isonzo and which have easy communication with this river. These Slovenes of the province of Udine, according to the census of 1911, numbered 31,730, to which must be added 4,650 Resians, who inhabit the valley of Resia in the basin of the Tagliamento and speak a dialect which seems to be related to Serbo-Croat. These Slovenes of the province of Udine do not anywhere, as they certainly did in the past, reach the plain and still less the Fella valley, along which run the frequented highway and railroad via Pontebba, while in the mountainous region where they have persisted, even if they are distinguished by

their origin and dialect from the people of Friuli, they nevertheless, like them, regard Italy as their fatherland.

The Upper Fella Valley

The upper valley of the Fella, on the other hand, is still subject to Austria as far as Pontafel, and throughout its small area of 220 square kilometers presents a singular succession of German villages alternating with Slovene villages. A little more than half of the entire population, which does not amount to more than 4,000, is Slav; a little less than half is German. It has been shown elsewhere how in this region German colonization has been superimposed upon that of the Slavs, as is the case throughout Carinthia, of which the upper Fella valley forms a part.

The Upper Adige District and the Trentino

The German-Italian Contact Zone

The valley of the Fella, belonging to the basin of the Tagliamento, is the only valley south of the watershed where for centuries Italians, Germans, and Slavs have lived side by side. The Slavs once extended west as far as the sources of the Rienz (south of Toblach) but left their only trace there in the place names; so that today to the west of the Fella we find only superimpositions of the German element directly on the Italian. These superimpositions took place during a long period of time, but the ethnographic situation today is substantially the product of the eleventh to the fourteenth centuries, during which German colonization, favored by the foreign lords, became possible because extended tracts in the Venetian mountains were sparsely populated, while they were rich in unexploited minerals, forests, and pastures. Small German groups crossed the Carnic Alps, entering the upper basins of the Tagliamento and of the Piave (the villages of Timau and Sauris in the former and Sappada in the latter, with a total population of less than 3,000, are still German), but the main channels of German penetration south of the watershed led along the upper forks of the Adige, which continue the lines of easiest communication between Central Europe and Italy. These lie over the Brenner (1,362 meters) and the Toblacher Feld (1,208 meters). The German colonization, though intense, was practically confined within the principal valleys, so that in the higher and more remote valleys the original Ladin population was able to persist for a long time, in some cases even to our own day. Hence beside the Val Monastero (Münstertal), which is connected with the basin of the Adige but is politically a part of Switzerland, the Val Gardéna (Grödnertal), an eastern tributary of the Eisack, is also Ladin, as well as the valleys of Marebbe (Enneberg) and Badia (Abtei), both of which send their waters to the Rienz. In the lower part of the valley of the Adige

the German infiltration was stopped by the presence of a more numerous Italian population, and here, between Bozen and Salorno (Salurn) lay a zone of contest between the two populations—a contest which still continues. But this did not prevent German colonization from thrusting small units much farther south, even to the Pre-Alps, in sight of the Venetian plain; but here, contrary to what happened in the upper Adige region, the Germans did not maintain themselves in the main valleys, but settled in the higher tributary valleys and on the table-lands. This is the case with the isolated German colony of the Mócheni in the valley of the Fersina east of Trent and with the Germans of Luserna, on the Austrian side of the plateau of the Sette Comuni. The whole plateau was once populated by Germanic peoples, but they are today in great part Italianized—the number of Germans in the Sette Comuni being only 2,800 in 1911—as are also almost all the inhabitants of the Tredici Comuni north of Verona, where in 1911 German was spoken by only 170 persons.

Germanization of the Ladins

While the ethnographic conditions of the Adige basin and the adjacent regions are largely due to the immigration of the period prior to the fifteenth century, yet many changes have taken place since, even down to our own time. On the one hand the Italianization of the more advanced German centers has made progress; on the other the Ladin element has become in most cases Germanized or is now becoming so. The latter phenomenon is due not so much to inferior civilization as to other circumstances.

The region about the headwaters of the Adige, once Ladin, lost its original character, not only through frequent contact with the German element but also because in the seventeenth century the local dialect was forbidden in order to prevent the spread of Calvinism in the Tyrol from the Engadine. On the other hand, with the change in the suitableness of a terrain to communication which modern progress in methods of transportation has brought about—a change which led to the abandonment of the uplands and divides formerly favored for secondary routes and the selection of the valley trenches, even when narrow—the elevated tracts and high tributary valleys populated by the Ladins partly lost contact with each other and established closer relations with the inhabitants of the deep main valleys. In general, they were no longer able to maintain the isolation which for centuries had preserved their characteristics. Another contributory influence to this result was the passing of tourists, who were in great part German. We are now referring to the Ladins in the Dolomites. By means of the schools and an intense propaganda organized by Austrian and German societies for the diffusion of the German language and influence, these Ladin populations are drifting away from their natural cultural affiliation, without making any appreciable resistance.

The Bozen Region

As has been pointed out, the zone for the possession of which the Italians and Germans have most contended and still contend has Bozen for its center and extends from Meran to Salorno. The valley of the Adige lies at a rather low elevation at this point (Meran, 301 meters; Salorno, 224 meters) and especially in the section above Bozen is well protected from north winds, has a limited rainfall, and enjoys a climate which permits the culture of the vine and of the mulberry, thereby making this the region in which Mediterranean vegetation and cultivation penetrate farthest into the Alps. On the racial distribution this fact has had two opposite effects: it has favored the inflow of Germans to certain centers as health and summer resorts, on the one hand, and, on the other, the immigration of cultivators from the Trentino into the rural districts. This last phenomenon arises from two causes: the Tyrolese have less experience than the people of the Trentino with intensive agriculture, and the latter, because of the economic conditions in their own district, have been compelled in the last decades to emigrate in large numbers, some going to distant America and others to the neighboring regions of the Tyrol and Vorarlberg. The 17,182 Italian immigrants from Austria listed in the United States census of 1910 under "foreign white stock" were almost all from the Trentino.

Through Bozen and the valley south of it passes the Brenner highway. Hence, the development of this center and of the region tributary to the highway always reflected the fluctuations of commerce and industry, which, in the past, have favored the influx now of Italians, now of Germans. Since the construction of the railroad the latter have had a distinct advantage. The conditions of the Italian element between Meran and Salorno have, therefore, been quite varied; of late, the Italians have tended to increase in the country and to decrease in the cities and towns. However, when we pass from this disputed territory and enter the high, tributary valleys, the upper Adige district is almost entirely German, whereas the Trentino is almost exclusively Italian.

Population of the Alto Adige and the Trentino According to Nationalities

The upper Adige district, i. e. the basin of the Adige above Salorno (7,178 sq. km.),[1] if we depend upon the Austrian census of 1910, which certainly is inexact but for which it is difficult to find any substitute, was inhabited by 215,345 Germans and 16,510 Italians. Even if this last figure ought to be doubled or tripled in an impartial reckoning, and with the addition of those born in Italy, the Italian element would still form a small minority.

In the Trentino (6,356 sq. km.), still according to official figures, the

[1] This district includes the administrative divisions, called political districts, of Bozen, Brenner, Brixen, Meran, and Schlanders.—Translator's Note.

Italians, exclusive of those born in Italy, numbered 377,039, the Germans 13,477; but this last number would be reduced to less than half if the members of the garrisons and the government employees were excluded. The Trentino, besides the middle section of the Adige basin between Salorno and the Italian frontier includes Giudicaria, i. e. the basin of the upper Chiese and the Sarca, with a part of Lake Garda; the Valsugana, i. e. the upper Brenta valley; and the regions around the sources of the Astico (Lavarone), of the Cismone (Primiero), of the Cordevole (Livinallongo) and of the Boite (Ampezzo). The two last regions, corresponding to the political district of Ampezzo (390 sq. km., 6,674 population), because of their history and their geographic conditions, are considered to be outside of the Trentino proper. The population speaks a Ladin dialect strongly affected by Venetian. In the Dolomites it is the district most frequented by foreigners; this explains why in the census of 1910 we find 443 persons who speak German. Though the Trentino does not represent a complete geographic unit, it possesses an individuality of its own, if only by contrast with the upper Adige district, in population and physical and economic conditions. The tree culture of the Italian plain and hills is widespread here, and around Lake Garda even the olive grows. Toward Italy are directed the aspirations and interests of the Trentino.

Individuality and Separatist Tendency of the Trentino

In earlier centuries this difference between the upper Adige and the Trentino was recognized politically in the independence of the episcopal principality of Trent, which lasted until 1796 and, though with a few variations in the boundary, embraced almost all the racially Italian area. Yet no account was taken of this difference by Austria in the present system of administrative divisions. In this the Trentino forms, together with the Tyrol, a single province (i. e. the County of Tyrol and Vorarlberg) whose government is in the main entrusted to the German majority. For, according to the census of 1910, in the total population of 1,049,169 the Germans numbered 651,858, the Italians 391,557.

The struggle of the latter for their liberation from the Austrian yoke assumed, then, not only the form of irredentism, or return to the Italian fatherland, but also agitation for administrative autonomy, or separation from the German Tyrol. Notwithstanding the legitimacy and legality of this demand, it was never heeded by the Austrian government. The Italianism of the Trentino, in culture, in tradition, and in sentiments, has been splendidly demonstrated not only in the daily opposition to the arrogance of the central and provincial governments and to the invasion of the German element, abetted by the Pan-German societies, but also in the support of schools and other cultural agencies through which even the lowest classes of the people tried to strengthen their Italian allegiance, even to the point of purging their dialect of the slight traces of German which

had crept into it during the centuries of commercial relations. Thus their aspiration grew continuously to free themselves from the double yoke of their forced membership in a foreign state and their administrative association with real enemies.

It is not out of place to recall here how the struggles undertaken within the sphere of Austrian law by Italian subjects of Austria, for the autonomy of the Trentino, for an Italian university in Trieste, and for many other ideal and material interests, had little effect, inasmuch as they were strenuously opposed by an always hostile government. This is because, while in the Adige region the Italians were in open opposition to the Germans, in Julian Venetia they were confronted chiefly with the Slavs; so that they did not have the support even of the latter, who ought to be, as they now are, their natural friends.

Italian Switzerland

The Two Teutonic-Romance Contact Zones

When we turn from the territories subject to the Austrian yoke to consider Switzerland, the problems of the contact between the Romance and Teutonic peoples present themselves under quite different aspects. Two contact zones should be distinguished, a longitudinal, running east and west, along which Rhaeto-Romans and Italians abut against Germans, and a transverse, running north and south, along which French peoples face the Germans. In the latter zone the German element comes into contact chiefly with populations whose dialect belongs to the Franco-Provençal group and whose written language and culture are almost completely French. The ethnic boundary was more subject to successive thrusts toward the west, the chief of which occurred before the year 1000. The French element strongly resisted this movement at various times, but it has resisted it especially in the last decades.

The German Wedge

The ethnic boundary between Germans and French lies not only in Swiss territory, but continues into Italian territory. Here, south of the Monte Rosa group the Germans in the valley of Gressoney (German, Lystal) are on the west in contact with Franco-Provençals of the valley of Aosta, among whom French holds first place in the church, schools, and in general culture. We also find Germans southeast and east of Monte Rosa in the upper Val Sesia and its tributaries (Alagna, Rima, and Rimella) and in the valley of Anzasca (Macugnaga). Gondo (G., Ruden) and Simplon (Simpeln) are also German; although on the southern side of the Alpine watershed, they belong politically to Switzerland. In Italian territory the valley of Formazza (G., Pommat), i. e. the uppermost valley of the Toce, and, in the Swiss canton of Ticino on the other side of the crest which encloses the valley on the east, Agaro and Bosco (G., Gurin) are likewise

German. It is probable that these German centers, which today number, all told, about 5,000 inhabitants, were in the past more numerous, but the more advanced of them, like Ornavasso on the lower Toce near Lake Maggiore, have not been able to avoid the assimilating influence of the more numerous and cultured Italian population, and this influence still continues in force.

Taken together as a unit, the Germans of these wild Alpine valleys form a wedge whose apex, at Issime,[2] is thrust forward to within 20 kilometers of the Po Valley. This wedge completely separates French Switzerland from Rhaeto-Romanic Switzerland, which includes almost all the valleys of the uppermost Rhine and Inn basins and the Val Monastero, already mentioned, all, except the last, lying north of the Alpine watershed. The watershed separates this valley from the rest of Rhaeto-Romanic Switzerland and puts it in more direct and intimate relation with German Tyrol.

The Rhaeto-Romans and Their Increasing Germanization

The condition of things as here set forth explains why the Rhaeto-Romanic people of the canton of the Grisons do not consider themselves Italians, as do the Ladins almost everywhere else in the Alps. The Rhaeto-Romanic people have tried to raise their dialects to the dignity of literary tongues, though with little result. This effort has hardly passed beyond the most elementary stage, for their culture is German and is growing increasingly so not only through the influence of the schools but also through commercial relations and the flourishing foreign tourist trade.

The Rhaeto-Romanic people of the Grisons could not look toward France, from which they are separated by too wide a German zone, nor towards Italy, from which they are cut off not only by the main divide of the Alps but also by differences of religion (they are largely Protestant) and feeling. In their inability to create for themselves a real language and a culture of their own and in their reluctance to adopt that of one of the great Latin nations, many students of the question see their weakness and fear their early disappearance.

Indeed the colonization by Germans of some of the valleys of the upper Rhine in the Middle Ages already at this time interrupted the continuity of the Rhaeto-Romanic territory. Furthermore, in many centers of mixed population, especially those on the floor of the main valleys, the German element has been increasing of late as a result of the growth of commerce and the influx of German travelers. The very favorable climate, both in summer and winter, of the Engadine, for instance, has made it and its center, St. Moritz, one of the most famous health and winter-sport resorts in the world. St. Moritz is frequented especially by Germans. The growth of

[2] In this commune the subdivision of Issime St. Jacob is German in speech while that of Issime St. Michael is French. In the schools Italian and French are taught, as in the other communes of the District of Aosta.

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APHIC MAP
F THE
OF NORTHERN ITALY
BY
MARINELLI

1:1 500 000

20 30 40 50 miles

Ligurians, Piedmontese
Lombards, Trentinians, Venetians
Rhaeto-Romans
Ladins, Friulians

less than 15%
15-50%
50-85%

Slovenes
Croats (Catholic)
Serbs (Greek-Orthodox)
Sometimes with German and Italian admixture the latter not over 15%

Schiavetto area (hybrid Slav-Italian dialect)

Germans (often with Slav admixture in the east)

Rumanians

Approximate limit of the North Italian Plain (Po Valley)
"Natural boundary" of Italy (i.e. the Po-Adriatic divide)

Drawn by Wm Briesemeister

J. BIEN LITH. N.Y.

the tourist trade has not caused any falling off in the old tendency of the natives of the Engadine to emigrate, usually for part of the year, to various parts of Europe.

The Number of Rhaeto-Romans

The number of Rhaeto-Romans in Switzerland has remained stationary for some decades at about 40,000, which represents a constantly diminishing proportion to the total population of Switzerland as well as to that of the Grisons, outside of which canton there are only a few thousand in other parts of Switzerland and some in Italy and the United States. (The census of 1910 showed 408 Rhaeto-Romans in the United States.)

The Italian Parts of the Canton of the Grisons

The canton of the Grisons also includes, south of the main Alpine watershed, territories with Italian populations (in all less than 10,000 people). These are the Val Mesocco and the Val Calanca, whose waters flow first into the Ticino and then into Lake Maggiore, and the Val Bregaglia and Val di Poschiavo, whose waters reach Lake Como through the Mera and the Adda. These form a part of so-called Italian Switzerland, which includes, in addition to these three little pieces of the canton of the Grisons and a small piece of the canton of Valais (the upper valley of the Diveria near the Simplon Pass), the whole of the canton of Ticino.

The Canton of Ticino

Italian Switzerland is lacking in geographic unity as well as in political unity. The territory itself of the canton of Ticino (2,801 sq. km.) is an aggregation of very different parts, with limits which cannot but appear very strange, especially where they include half of Lake Lugano, leaving on one of its shores, as an exclave in Swiss territory, a small area belonging to Italy (Campione). The canton of Ticino, like all of Italian Switzerland, is, in fact, conquered territory.

When the strategic importance of the relevant passes is considered—Simplon, St. Gotthard, Lucomagno, San Bernardino (connecting the Val Mesocco with the Rheinwaldtal), Maloggia, Muretto, and Bernina—it is easy to understand why Switzerland strove to possess them. The consequent extension of Swiss territory encompassed areas purely Italian not only in population but also in type of cultivation. On the Swiss shores of Lake Lugano and Lake Maggiore the vine and mulberry and in some places even the olive flourish. The districts constituting the present canton of Ticino were severally joined to Switzerland at various times and were variously governed, but always as conquered territory, until 1803, when the Ticino became an independent state of the Confederation.

The population (160,680 in 1913) is altogether Italian both in dialect and culture and, moreover, is attached to Italy by strong economic interests; but it is much more closely attached to the Swiss Confederation

because of the great political liberty granted by its constitution; so there is no marked tendency to reunite this region with the rest of Italy. Moreover it should be remarked that, while the canton of Ticino has furnished a considerable emigration, especially to the United States (the census of 1910 enumerated 14,923 Italian Swiss), it has experienced an intensive agricultural colonization by Lombard peasants, so that half of the present population of the canton is estimated to consist of families born in Italy who have established themselves there in the last fifty years. Then, too, the region, like almost all of Switzerland, is subject to an intense temporary immigration of Italian workmen and day laborers, who spend the working season there and return to their homes for the winter. Indeed, this periodic migration affects all the countries which border on Italy.

The Franco-Italian Contact Zone

In the western Alps there is no clean-cut boundary between the dialects which may be called Italian and those which should be regarded as French; in most cases only a trained philologist could decide whether certain valleys or districts ought to be placed on one side or the other of this boundary. It appears upon examination that, along the Riviera, the dialect spoken at Mentone is Provençal, while at Ventimiglia it is still Ligurian; so that the political boundary of Italy at this point does not diverge much from the dialectal boundary.

In the Alps of Liguria and Piedmont, however, the Provençal and Franco-Provençal dialects occupy all the upper valleys of the tributaries of the Po, in some places even approaching the plain, where Gallo-Italian dialects are spoken, which represent a transition between the Italian and French dialects.

The Italian literary language and culture, equally with the French, found a soil favorable for development among these different populations. The preference for one language or the other in a given region was usually dependent on its political affiliation or other historical vicissitudes. Hence, the boundary between the Italian and French literary languages does not coincide with that between the Italian and French dialects.

Number of French-Speaking People in Italy

From the last Italian census (1910) we can learn, not how many people speak the Provençal and Franco-Provençal dialects within the Italian boundaries, but only how many of them use French as the language of the church, of the school (where it is usually spoken along with Italian), and of culture in general. The census shows that 70,560 inhabitants of the administrative district of Aosta spoke French. In the valley of Aosta, Italy has actually kept French in the elementary schools, and in the churches French is used. In the Susa district there are 7,070 French in

the villages of the upper Dora Riparia valley; this area is one of the territories east of the Alpine watershed which was longest under the rule of France (until the Treaty of Utrecht, 1713), and with France, too, it was further related by cultural and commercial contact through the Mont-Genèvre Pass. Next to the south lie the valleys of the Chisone and the Pellice, which are inhabited by the Waldensians, the well-known Protestant sect, which, after many persecutions in the Dauphiny and in Savoy, found a final refuge here. According to the census of 1910 there were 8,330 French-speaking people in the administrative district of Pinerolo, which includes these valleys. The dialect of the Waldensians is Provençal, differing, however, from that of the adjoining regions because the Waldensians came from the Dauphiny and settled in the territory which they now occupy only in the Middle Ages. The official language, as well as that of their church and culture, is French.

The Waldensians

It is important to remark that the official language of the Waldensians was Italian until they had to call in the services of pastors from Geneva, because almost all their own native pastors had fallen victims to the pestilence of 1630. The French literary language was thus introduced. It has since flourished because it conformed more closely to the character of the local idioms, but especially because it became, as it were, the symbol of their spirit of rebellion against the Church of Rome. While the French-speaking persons in the district of Pinerolo number 8,330 according to the Italian statistics, the Protestants of the same district, i. e. the Waldensians, number 14,841; the difference indicates that the Waldensians are largely bilingual. The total number of Waldensians is, however, much greater than these figures indicate, for they do not include the numerous colonies of that sect in Italy, elsewhere in Europe, and in the western hemisphere (especially in Uruguay).

Italian Populations in France: Nice

While some populations with Provençal and Franco-Provençal dialects and often even with French language and culture are thus included within the political boundaries of Italy, there are some populations with Italian dialects and Italian culture within the territory of France. To be sure, the only populations in France with Italian dialects are the inhabitants of that section of the middle valley of the Roia which, being included in the old County of Nice, was detached from Italy in 1860, when this county was ceded to France. Nice, with a good part of the Nice region, including also the principality of Monaco, was at that time prevailingly Italian in language and culture. But gradually, as the "Côte d'Azur," or French Riviera, has become one of the most frequented winter resorts of the world, the old traditional culture has grown weaker and in some places has even disappeared, so that the whole region, including Nice, the birthplace of Garibaldi, has become

almost entirely French. The old character was but little fostered by the modern stream of Italian immigration to this region (the Italians number 30,000 in Nice alone). Beside the Côte d'Azur other centers of the south coast have been affected by this immigration, especially Marseilles, where there are about 100,000 Italians who were born in Italy. But their influence was much less than the number would indicate, because for the most part their sojourn is temporary and they belong mostly to the laboring and servant class.

Italian Emigration to Southern France

This Italian migration into southern France, in its causes and its character, is of exactly the same type as that to Switzerland, Trieste and Fiume, and Austria-Hungary in general. The consequences of this migration, while identical in their influence on the economic and social conditions of the countries bordering on northern Italy, are very different in their effect on the spread of Italian culture. The Italians who change from temporary sojourners into permanent inhabitants of the countries which receive them are quickly assimilated in France, while in Italian Switzerland, in the Trentino, and in Julian Venetia they go to swell the Italian element and the strength of its resistance against the foreign elements.

The ethnographic and political consequences of this modern migration of Italians, which has taken place on so large a scale to the New World, within Europe itself, and to the Mediterranean countries, are not all evident, nor is this the place to consider them.

Bibliography*

G. Marinelli: Slavi, tedeschi, italiani nel cosidetto "litorale" austriaco, *Atti Ist. Ven.*, III, ser. VII, 1885.

M. G. Bartoli: Lettere Giuliane, Capodistria, 1903.

N. Krebs: Die Halbinsel Istrien, *Geogr. Abhandl.*, Vol. 9, No. 2, 1907.

P. S. Leicht: Le terre irredente nella storia d'Italia, Soc. Stor. Friulana, Udine, 1916.

F. Musoni: La Nazione slovena e l'attuale momento politico, Milan, 1916.

C. Battisti: Il Trentino, Novara, 1917.

A. R. Toniolo: Gli italiani nell'Alto Adige: Loro distribuzione ed espansione in rapporto alle condizioni geografiche della regione, *Archiv. per l'Alto Adige*, 1916.

Knapp, Borel, and Attinger: Dictionnaire géographique de la Suisse, Neuchâtel, 1908, article "Suisse."

C. Salvioni: I dialetti alpini d'Italia, *La Lettura*, August, 1901.

C. Salvioni: Ladinia e Italia, Pavia, 1917.

G. Morosi: L'odierno linguaggio dei Valdesi del Piemonte, *Archiv. Glottologico Italiano*, Rome, 1890.

C. Guarnier: Note sur la repartition des langues dans les Alpes occidentales, *Rev. de Géogr.*, 1897.

A. Rolando: Il confine italiano nelle Alpi Marittime, *Riv. Mensile del Club Alpino Italiano*, 1898.

* The bibliography of the subjects discussed in this paper is very extensive. Only a few of the most important or less known references are listed here.

HIGH-ALTITUDE FLYING IN RELATION TO EXPLORATION

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There is no phase of aëronautical development that appeals to the geographer more keenly than the prospective use of the airplane in the exploration and mapping of the still unknown or little-known regions of the earth. In most cases the problem of such exploration involves the covering of areas of relatively great horizontal extent, requiring long-distance flights at low altitudes. A different type of problem, however, is encountered in the exploration of lofty mountain ranges, where high-altitude flying is involved. It is here proposed to discuss the vertical range of airplane flights in relation to this second type of exploration.

The trail of the airplane has already been carried over several of the world's famous ranges—over the Alps and the Andes; and new roads of conquest have been made in an interesting series of flights across the classic and forbidden ground of the Atlas. Last year three French aviators under the direction of Commandant Cheutin, Director of the French Air Service in Morocco, using Voisin bombing biplanes flew from Meknes to Bou Denib, crossing both the Middle Atlas and the High Atlas. The following day three small Nieuport pursuit-type biplanes made the return flight from Bou Denib to Meknes. One of the aviators continued on to Rabat. It was a flight of about 260 miles each way at heights of about 15,000 feet, because parts of the High Atlas are from 12,000 to 14,000 feet high. It was made successfully in a little over three hours. Previously Lieutenant Vasseur had crossed the High Atlas from Agadir and Marrakech. The mountain flying that has already been accomplished encourages aviator and geographer to look towards the conquest of the loftiest and least attainable of the world's ranges—the Himalaya.[1]

High-Altitude versus Long-Distance Flights

Certain remarkable developments that have taken place in aëronautic art and science in the past six months make the problem of crossing the Himalaya seem easier to solve than the problems of certain proposed long-distance flights. It appears easier than the problems connected with the proposed transatlantic flights—which include seven different plans[2]—or those connected with the projects of Rear Admiral Robert E. Peary and

[1] For a suggestive paper bearing on the topic see A. M. Kellas: The Possibility of Aerial Reconnaissance in the Himalaya, *Geogr. Journ.*, Vol. 51, 1918, pp. 374-389.

[2] See a number of articles in *Flying*, Vol. 7, 1918-19, pp. 508-521, especially p. 521.

FIG. 1—Airplanes flying in battle formation, Rockwell Field, San Diego, Cal. The birdlike quality of the airplane is vividly brought out in this photograph. (Copyright by the Committee on Public Information.)

Captain Robert A. Bartlett, which provide for flights from Cape Aldrich to the North Pole and back, and from Cape Aldrich to Cape Chelyuskin, on the Siberian side.

In crossing and flying over the Himalaya there is really only one cardinal factor to be considered—*great altitude*. In Arctic exploration and transatlantic flight we have three other requirements to be met:

(1) A sustained flight, twice as long as the longest yet made.

(2) From ten to twenty-five hours continuous service of the pilots on the airplane.

(3) The use of instruments for determining the course when astronomical observations, "shooting" the horizon, and ascertaining the airplane's speed and drift are, to put it mildly, difficult.

Furthermore great altitude has had to be considered as a factor in making plans for Arctic or transatlantic flight because the present-day airplane is just large enough to carry the load necessary to make a continuous flight from St. Johns, Newfoundland, to Ireland, without much margin and there may, therefore, be an advantage in flying at altitudes of from 15,000 to 25,000 feet in order to gain the increase of speed afforded through the help of the winds prevailing at those altitudes.

Flying over the Himalaya

The problem of flying over the Himalaya resolves itself into three parts:

(1) Crossing the mountains by flying through the passes or gorges or by passage over the main range and avoidance of the high peaks.

(2) Flying over the highest peaks, including Mt. Everest, which is 29,002 feet, and Mt. Kangchenjhau, which is almost as high.

(3) Making a landing on the ranges.

According to Dr. Kellas the main range could be crossed at an altitude of 23,000 to 25,000 feet by avoiding the peaks that are over 24,000 feet high, of which, so far as is known, there are about eighty. Further, by utilizing passes or gorges transit could be made at a still lower elevation—not over 19,000 feet. These altitudes can be reached by present-day airplanes. There are a great many airplanes used by the British and the other Allied nations that have a "ceiling" (maximum altitude attainable by the plane) of approximately 30,000 feet with the usual military load; and the flight across the Himalaya through the gorges and passes would not be considered more difficult than the flights made daily over the enemy's barrage fire, where in addition every cloud may hide a squadron of enemy fighting planes. It certainly would not be as difficult as was the flight of the squadron of Italian S. V. A. single-motored biplanes that, under the command of Major Gabriele d'Annunzio on August 10, 1918, flew from Venice to Vienna, a trip which involved more than two hours' flying over the Alps. In regard to the altitudes attainable by airplanes in present use we have certain recently established records.

Record Altitudes Reached by Airplane

On August 12, 1918, Captain (now Major) R. W. Schroeder made a record flight of 26,850 feet at the Wilbur Wright Field, Dayton, Ohio. A few weeks later he established a new record, going up to 28,900 feet (corrected altitude), only a hundred feet less than the height of Mt. Everest. Major Schroeder has described his experiences.[3] The flight was the culmination of a series of experiments and of continuous experience in high-altitude flying. "I had been to 12,000 feet at different times and

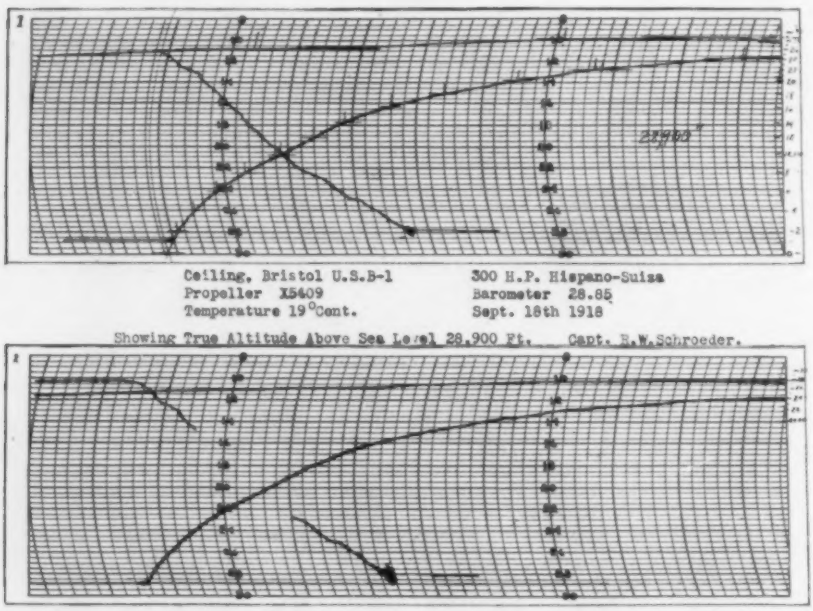

Fig. 2—Barograph curves of Major Schroeder's record flight of 28,900 feet on September 18, 1918. The scale of feet is on the right. Both barographs were calibrated by the Bureau of Standards and also calibrated in the McCook Field laboratories just before the flight.

experienced no difficulties," says Major Schroeder. "After being put in charge of the Testing Squadron at Wilbur Wright Field, my duties required me to go to the ceiling with all new types of high-powered battle aëroplanes, which were being experimented with by the United States Government. . . . During these trips I would quite often go without the use of oxygen, and in time I discovered that I was becoming accustomed to the rare, thin air. However, I did not seem to be able to go above 23,000 feet at any time without feeling a sort of sleepy, tired, cross, and hungry feeling, which I was unable to overcome except by the use of oxygen." This would seem to be a confirmation of the suggestion put forward by

[3] See R. W. Schroeder: How I Made the Altitude Record of 28,900 Feet, *Flying*, Vol. 7, 1918-19, pp. 906-907.

Dr. Kellas, "It is quite possible that by repeated trial flights from sea level to 22,000 to 25,000 feet, using oxygen only when absolutely necessary, the alveolar epithelium might be educated to make the most of a minimum supply of oxygen."[4]

Respecting his record flight Major Schroeder reports that at 27,000 feet he began to suffer from the cold, raw air; but he kept on climbing until his oxygen supply began to give out, and shortly afterward the motor stopped for lack of gasoline. At the maximum height the thermometer registered

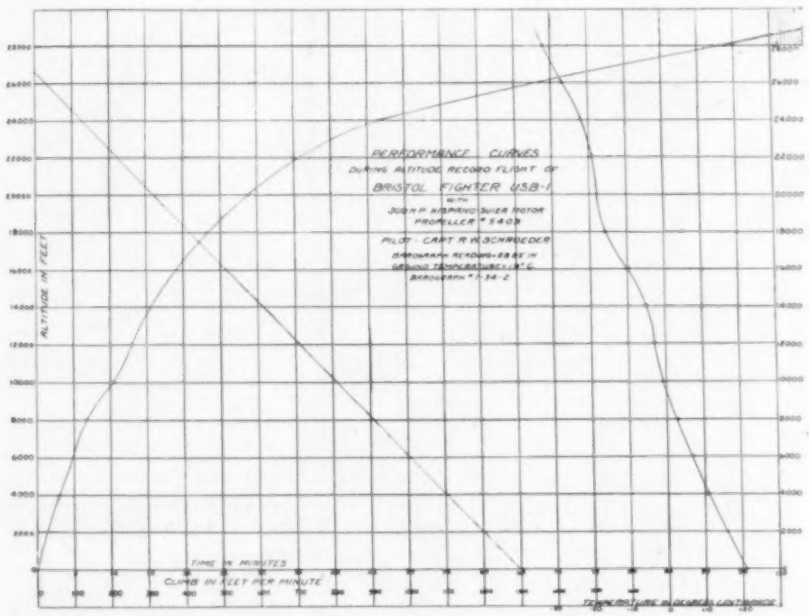

FIG. 3—Performance curve of Major Schroeder's record flight. To the right is also shown the curve of temperatures. At the highest altitude the temperature of −32° C. was recorded.

—32° C. Hands and face became numb, and on descent lips and fingers were found to be frozen and in need of medical attention. Major Schroeder, however, expressed the opinion that with a few changes and improvements in equipment he should be able to get up to 30,000 feet or more.

On January 2 of this year Major Schroeder's record was broken at Ipswich, England, by a British aviator, Captain Andrew Lang, who climbed to 30,500 feet. Captain Lang's observer fainted through lack of oxygen, his supply pipe having been broken by the vibration, and on descending both observer and pilot were suffering from frostbite. Commenting on the performance, *Nature* remarks: "the height attained was limited by the failure of petrol-pump pressure, due to the rarity of the air, and not by the

[4] Article cited in footnote 1, p. 380.

aërodynamic performance of the machine'' . . . . ''It would appear, however, that even greater heights could be reached if minor difficulties, such as those connected with carburation at low temperatures and the maintenance of the pilot's comfort, were overcome.''[5]

The Mechanical Problem of Flying Over the Highest Peaks

To carry out the project of flying over Mt. Everest and Mt. Kangchenjhau it will be necessary to build special airplanes. It is of little value from a military viewpoint to have a plane with a ceiling of 35,000 feet unless it can carry guns and munitions and the pilot can patrol for about two hours. In addition, the machine must have a maximum equipment of safety to

Fig. 4—Russian aviators starting for flights in mid-winter. The airplanes on the right are equipped with skids for snow-landing instead of with wheels, as in the usual type on the left.

enable the pilot to make vertical turns, to do the ''roll,'' the ''falling leaf,'' the ''Immermann turn,'' the ''nose dive,'' the ''loop,'' and other similar maneuvers that may be necessary in the course of an aërial flight; the machine must also have a very high horse-power motor to insure maximum speed.

The explorer can dispense with machine guns and ammunition, although he should carry a gun for protection in case he lands away from his starting point. He can also dispense with one hour's fuel, and the construction of the machine can be lighter. But these two considerations should come last. The greatest saving in weight will be in having a smaller motor—and correspondingly less fuel and tankage.

Flying at Low Temperatures

The writer has followed closely the progress made towards the solution of the problems of winter flying since 1914, when he was asked by the

[5] *Nature*, No. 2567, Vol. 102, 1919, Jan. 9, p. 369.

friends of Vilhjálmur Stefánsson whether it would be possible to use airplanes in connection with a proposed relief expedition. The plan looked difficult at the time, but, considering the stakes involved, the chances of success seemed sufficient to justify the undertaking. It was, however, a plan which could be carried into effect only during the six or eight weeks of summer weather. The airplanes could be got together, but the rest of the expedition could not be organized in time; therefore the plan had to be given up. But the project for aviation in the Arctic did not end there.

FIG. 5—The High Atlas photographed from one of the French military airplanes that flew over the range. The higher crests are visible in the extreme background.

In 1916 Admiral Peary opened another opportunity for the writer to study the subject in connection with Captain Robert A. Bartlett's project to fly from Cape Aldrich to Cape Chelyuskin. Captain Bartlett's plan would have been carried out in 1917 had not the war prevented. Today the vision of these two hardy American explorers seems to be well on the way towards materialization. The Aero Club of America plans to send out an aërial polar expedition under Captain Bartlett in June, 1919.[6] The experiences of its members will contribute not only to the solution of the immediate problem but also to our general knowledge of flying in relation to snow and ice surfaces—knowledge that may well prove helpful on the Himalaya.

A great deal of flying in cold weather and over snow surfaces was done on the different battle fronts in the winter of 1917-1918, as well as at the aviation schools in Canada and the United States, and considerable data

[6] See: Captain Bartlett's Arctic Expedition. *Flying*, Vol. 7, 1918-19, pp. 1148-1149.

and photographs were collected at the time. The writer also had occasion to question Russian aviators regarding their experiences in flying in Russia during the winter of 1917-1918, under conditions which were probably more severe than aviators would meet in flying over the Himalaya ranges. They were obliged to fly daily for months and to face German anti-aircraft guns and German airplanes. All observations go to show that the solution of the problem of flying in cold weather consists largely in providing suitable clothing for the aviator. Furthermore the airplane can itself be equipped to give a certain protection. The military aviator cannot be enclosed in a cabin, to be sure, but the explorer can be protected by a hood of transparent material. The sides and bottom of the plane can also be constructed of transparent material, which will give him a clear and wide view and permit him to see everything about him as he flies.

Physiological Effects of High Altitudes

At high altitudes the effect of the rarefaction of the air is more important than the influence of the low temperature. The effect on aviators of flying at high altitudes is a matter about which there are as yet no exact data. Ever since aviators began to fly above the 2,000-foot mark we have been hearing of possible physiological effects. Only a very small percentage of aviators complain of physiological difficulties. The proportion is probably not larger than is to be found in practically every other line of human activity.

The effect of mountain climbing is not a good criterion from which to judge the effect of high flying, just as the sensation of looking down from a high building is no criterion from which to judge the sensation of looking down from an airplane while flying. The aviator has this advantage over the mountain climber, that he can start out in perfect physical condition and can accomplish the entire journey in a few hours, whereas it would take the mountain climber days or weeks. Reports carefully kept by the writer of the experience of aviators and balloonists who have made altitude records show that flying at high altitudes is by no means as difficult as it is thought to be.

History has recorded several deaths as attributable to rising to high altitudes without a proper supply of oxygen. Whether history is right or not, remains for the future to prove. H. F. Sivel and J. E. Crocé-Spinelli met their death in April, 1878, in ascending to 28,200 feet in a balloon; and the Germans, Arthur Berson and R. J. Süring, who reached an altitude of 35,000 feet (accepted as the record) in 1901, descended in rather bad condition. These cases were attributed to altitude sickness (hypsozemia); but the writer is led to believe from his own experience that those pioneers may have been victims of asphyxiation, owing to their rising so fast that they were suffocated by gas escaping from their balloon. Another remarkable balloon ascent was made in May, 1913, by three Frenchmen,

Jacques Schneider, Maurice Bienaimé, and Albert Senouique. M. Schneider reported the experiences of his party in *Flying* for January, 1914.

At 2.35 we attained the 7,000 meters altitude. The view below was less clear; a thick layer of cirrus enveloped us and moved slowly like shifting mountains of light wadding. At 3.00 o'clock we reached 8,000 meters and we met snow which troubled somewhat our progress in altitude. At 3.15 we had reached a height of 9,000 meters and at 3.32 Mr. Bienaimé, who had taken his turn in service, emptied the 109th bag

FIG. 6—Photograph from an airplane of an area in northeastern France from an altitude of 8,500 feet. Aërial photography is the most important adjunct of exploration by aircraft.

of ballast. At 3.35 we reached the height of 10,081 meters. Besides the equipment we only had on board three bags of ballast. We passed our time in making observations. Mr. Senouique tried his strength on the dynamometer. On earth it was 105; it now passed 110. That of Mr. Bienaimé, which was 140 on earth, was now 155. This indicated a similar increase in proportion. The ultra-violet rays were found to be more numerous here, and their intensity was remarkable. . . . We began to descend at 3.40; we were at 8,000 meters at 4.14; our speed of descent was, therefore, 166 meters per minute. There the bag took a fusiform shape and our parachute, which had been stiff until now, began to flap. At 3,000 meters we finally took off our oxygen masks, which we had lifted on several occasions during the ascension, so as to make note of physiological phenomena. I want here to express my admiration for the courage and devotion to science of our eminent friend, Mr. Senouique, for the very convincing experiments which he made at the greatest altitudes. We conducted these under most trying con-

ditions: at 10,000 meters, when one's heart is beating at a rate of 110 pulsations per minute, producing in the arteries and in the veins a pressure equal to a column of about 25 centimeters of mercury; when the exterior pressure was 210 millimeters, and the interior pressure 250 millimeters—which produces in the tissue of the circulation system a tension powerful enough to cause death.

Mr. Alan R. Hawley, President of the Aero Club of America, and Mr. Augustus Post in their many balloon ascensions have reached heights of over 25,000 feet. In one of the National Balloon Races they rose to a height of 25,000 feet; during the St. Louis-to-Canada trip they remained for about six hours at a height of some 15,000 feet. Breathing was a little hard, but they felt no ill effects afterward.

The physiology of high-altitude flying is an interesting and important subject; with the increasing need of knowledge in regard to it, it is hoped that reliable data will be collected on which definite conclusions can be based.

Landing Airplanes on the Himalaya

Landing airplanes on such surfaces as the Himalaya may be expected to present, and starting again, will be mainly a matter of skill and organization. A specially made airplane for flying at high altitudes may not have a speed of more than 75 or 80 miles an hour and would have a very low landing speed. It would also be a very light machine and, if possessing a margin of power, could rise from a flat clearance of from 400 to 500 feet. In preliminary flights the aviator could drop tents, bags of food and equipment, and spare parts on a selected spot near the place where he intended to land. Dropping these things from an airplane would not be difficult. It was done repeatedly by the British aviators at Kut. Italian aviators also dropped bread and provisions on the mountains for their forces which had been cut off from their lines of communication and had exhausted their supplies. The aviators carried sufficient food and provisions to last them many days.

Having carried and dropped all the equipment necessary, the aviator could then attempt the landing. It would be well for him to carry a passenger in order to have some one ready to assist him in case he found it necessary to make repairs, or ready to arrange for the return trip on foot in case he found it impossible to start again.

It is hardly necessary to go further in speculating regarding the possibilities of landing on and starting from the Himalaya. Wherever there is a clearing of from 500 to 1,000 feet, there an airplane can land and from thence it can start. Instances of suitable locations are given by Dr. Kellas.[7]

The challenging barrier of the Himalaya will succumb to the airman. Mt. Everest and Mt. Kangchenjhau will stand as milestones in the history of man's conquest of the air and as landmarks to the airmen who will link British India with other civilized centers.

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[7] Article cited in footnote 1, p. 379.

RAISED BOGS IN EASTERN MAINE

By GEORGE E. NICHOLS
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Occurrence of Surgical Sphagnum

During the summer of 1918 the writer, acting in the capacity of Botanical Adviser on Sphagnum for the American Red Cross, was called upon to secure information regarding the location in the East of sources of supply for sphagnum moss suitable for use in surgical dressings. Sphagnum was being used on a vast scale abroad and in Canada as a substitute for absorbent cotton in making pads or compresses and had proved itself singularly adapted to this purpose by reason of its very high absorptive capacity.[1] In March, 1918, it had been officially adopted by the American Red Cross as a standard surgical material. But, while there were known to be extensive areas of suitable moss in the Pacific Northwest, very few data were available regarding its occurrence in the East. There had been, and there continued to be, reports of good material from various sections; but investigation of these, as well as other sources of information, had seemed to indicate that throughout most of the eastern United States sphagnum of the quality required for surgical work, if not entirely absent, was either very local in its occurrence or else present in too small amounts to be of practical value. It was known, however, that in southern New Brunswick and in parts of Cape Breton, there were abundant supplies of high-grade surgical sphagnum.

Its Association with Raised Bogs

It was also known that in these regions raised bogs were of frequent or even common occurrence. The theory therefore suggested itself that the raised bog might well be taken as an indicator of climatic conditions suitable to the growth of surgical sphagnum. In other words, since a raised bog is itself largely built up by various species of sphagnum and since it is dependent for its existence on precisely those climatic conditions which are congenial to the development of surgical sphagnum, it naturally follows that surgical sphagnum is to be looked for in greatest abundance and luxuriance in regions where raised bogs are well developed. With this deduction in mind, it was decided that the region in the eastern United States where the chances of success in locating supplies of surgical moss were the most favorable lay along the coast of eastern Maine. For, while there was very little favorable evidence in the way of either reports or

[1] For a somewhat detailed discussion of this subject see the writer's article: The Sphagnum Moss and Its Use in Surgical Dressings, *Journ. New York Botanical Garden*, Vol. 19, 1918, pp. 203-220; also reprinted in *Scientific American Suppl. No. 2257*, Vol. 86, 1918, Nov. 16, pp. 308-311, under the title "Are You Collecting Sphagnum?"

FIG. 1—General view of the Denbo Heath, a large raised bog at Deblois, Maine, covering several square miles of territory. The bushy foreground and the tract of partly burned forest in left mid-distance are not in the bog itself.

herbarium specimens, it was known that eastern Maine was a very boggy country and also, in a vague way, that some at least of the bogs were of the raised type.

The Field Investigated

Altogether, one month was spent in this region. Starting in at Portland and at Wayne (situated approximately 50 miles north of Portland) investigations were conducted in the vicinity of fourteen different towns between there and Calais, which lies on the Canadian border. In nearly all of these localities an automobile was placed at the writer's disposal during his stay, so that it was possible to cover a great deal of territory within the limited time available. In addition, in many places a competent guide was provided, which facilitated matters greatly. Under the circumstances it was of course impossible to make any detailed studies along strictly botanical lines, and very few written data were secured; but it was equally impossible to neglect entirely the ecological aspects of the trip, particularly certain very obvious facts regarding the occurrence and general features of the raised bogs in this region. It is these which form the principal theme of the present paper.

State of Knowledge Regarding North American Raised Bogs

The raised bog or high moor is one of the most remarkable of all swamp types. It is a type of swamp extensively developed in parts of northern Europe and has been described in great detail by various European scientists. But comparatively little has been written regarding these swamps in North America. Shaler, in his monograph on the freshwater morasses of the United States, seems to have been the first to call attention to their occurrence on this continent. His observations were as follows:

> In northern Europe and elsewhere the species of sphagnum often develop luxuriantly on slopes having a declivity of as much as 5°, so that the bog may rise to the height of some scores of feet above the level of the water in which it originates and may ultimately come to have many times its original horizontal extent. Within the limits of the United States the summers are generally so hot and dry that the climbing bogs due to sphagnum growth are of inconsiderable extent and rarely have an inclination of more than 2°. The American instances of these climbing bogs which I have observed are mostly limited to the eastern portion of Maine, near the shores of the Bay of Fundy. Faint traces of the same mode of growth are observable in certain areas of New Hampshire, and in a yet slighter measure in the northern part of Michigan and Minnesota. Even as far south as the swamps of Virginia and Carolina the sphagnum grows weakly above the level of permanent water, but it does not form a sufficiently thick mat to induce a permanent marshy character on the surface. I have never seen the coating of humus produced by it with a thickness of more than six inches in that part of the country.[2]

Ganong was the first to publish an adequate description of this unique type of swamp in North America. He discussed in considerable detail the raised bogs in that part of the Province of New Brunswick bordering the

[2] N. S. Shaler: General Account of the Fresh-Water Morasses of the United States, with a Description of the Dismal Swamp District of Virginia and North Carolina. *10th Ann. Rept. U. S. Geol. Survey*, 1888-89, Part I, pp. 255-339; reference on p. 286.

Bay of Fundy and indicated the occurrence of similar tracts in Nova Scotia, Anticosti, and Newfoundland.[3] In a later paper he described the raised bogs found on Miscou Island, in northern New Brunswick.[4] More recently Anrep has given a brief account of certain raised bogs on the peninsula of Nova Scotia and has indicated the absence of bogs of this type from those parts of Manitoba, Ontario, and Quebec which he had explored.[5]

The writer of the present article has described at some length the raised bogs of northern Cape Breton[6] and has noted the marked resemblance which these bear to those described by Ganong in New Brunswick. It was remarked that in all probability the raised bog is a not infrequent type of swamp along the Maine coast as far south as the vicinity of Portland, and that it evidently is of quite common occurrence northeastward. This conclusion was based very largely on scattered observations made by Bastin and Davis in their report on the peat deposits of Maine, Shaler's remarks having unfortunately been overlooked. Bastin and Davis distinguished between two types of peat deposit: "the filled basin, in which most of the material has been gathered below a permanent water level, and the built-up plain, in which the water level may be practically always below the surface of the peat, but in which it rises, either steadily or periodically, as the remains of plants collect."[7] Bogs of the latter type the authors also designated as "built-up bogs" but, whether intentionally or not, they did not employ the terms "raised bog" or "high moor."

But although in a general way it is to be inferred from the Bastin and Davis report that many Maine bogs belong to the built-up type, in only a very few instances out of the seventy swamp tracts treated do they clearly indicate whether the surface in specific bogs is flat or convex, or whether these belong to the filled-in or to the built-up type. Yet it would seem to the writer that the contour of the surface of a deposit ought naturally to be one of the first things noted by a peat investigator; since surely a dome-shaped bog, especially one overlying a nearly flat land surface, must be far more easy to work than a flat bog formed in a water-filled depression.

Coastal Region of Maine the Chief Area of Development in the Eastern United States

During the summer of 1917, in company with Dr. Harold St. John of the Gray Herbarium, the writer traveled by canoe from Moosehead Lake,

[3] W. F. Ganong: On Raised Peat-Bogs in New Brunswick, *Botanical Gazette*, Vol. 16, 1891, pp. 123-126.
Idem: Upon Raised Peat-Bogs in the Province of New Brunswick, *Trans. Royal Soc. of Canada*, 2d Ser., Vol. 3, Section IV, 1897, pp. 131-163.

[4] *Idem:* On the Physical Geography of Miscou, *Bull. Nat. Hist. Soc. of New Brunswick No. 24*, St. John, N. B., 1906, pp. 447-462.

[5] A. Anrep: Investigation of the Peat Bogs and the Peat Industry in Canada, 1913-14, *Canada Dept. of Mines Branch Publ. 351*, Ottawa, 1915.

[6] G. E. Nichols: The Vegetation of Northern Cape Breton Island, Nova Scotia, *Trans. Conn. Acad. Arts and Sci.*, Vol. 22, 1918, pp. 249-467; see especially pp. 433-456.

[7] E. S. Bastin and C. A. Davis: Peat Deposits of Maine, *U. S. Geol. Surv. Bull. 376*, Washington, D. C., 1909.

in northwestern Maine, northward up the northeast branch of the Penobscot River, across by carry into the headwaters of the St. John River, and thence down the St. John to Fort Kent, a distance altogether of about two hundred miles. Nowhere along this route was anything in the nature of a raised bog encountered. In view of these and other observations it seems safe to assert: (1) that in the state of Maine raised bogs, in so far as they constitute a distinctive swamp type, are virtually restricted to the proximity of the seacoast; and (2) that in other portions of New England and

FIG. 2—A characteristic view of the vegetation in the Denbo Heath, a raised bog at Deblois, Maine. A dense growth of low shrubs, mainly members of the heath family, covers the surface over much of the bog.

of the eastern United States this type of bog is practically absent, although in occasional swamps it is possible to detect a slight elevation of the surface above the level of permanent ground water.

DESCRIPTION OF RAISED BOGS ALONG THE MAINE COAST

An itinerary of the route covered by the writer in eastern Maine during the summer of 1918 is given below, together with brief observations regarding the occurrence, etc., of raised bogs in this region.

Portland. No raised bogs were seen or reported in this vicinity, although several flat bogs were visited. Bogs of any description, however, are comparatively infrequent.

Wayne. This region abounds in bogs of the flat type.[8] Of the fifteen bogs visited, only one (Burr, Area 8) is distinctively of the raised type,

[8] See F. F. Burr: The Occurrence of Peat in the Livermore Quadrangle, Maine, *2d Ann. Rept. Public Utilities Commission, State of Maine, for the Year Ending Oct. 31, 1916*, Waterville, 1917, pp. 76-97.

and even in this case the elevation of the center above the margin is slight, scarcely two or three feet.

Augusta. The Great Sydney Bog, situated about five miles north of this city (Bastin and Davis, Locality 25), is a typical raised bog. It covers an area of about one square mile and exhibits the convex surface contour so characteristic of raised bogs. Between the lower parts along the margin and the higher parts toward the center there is a vertical difference in elevation of more than six feet (measured with hand level). The northeast portions of the bog are lower than the southwest, but it apparently is drained by brooks at either end. Eighty miles of travel in the vicinity of Augusta failed to reveal any other raised bogs.

Waldoboro. About fifteen bogs were visited in this swampy district. Several of these appeared to be of the "built-up" type (having been formed over flat ground rather than in a depression), but in only one instance was the domed surface contour evident. In this case, a small bog bordering Sidensparker Pond, there is a rise of two or three feet from margin to center.

Rockland. A large bog situated about two miles west of this city (Bastin and Davis, Locality 29) and covering an area of somewhat over a square mile obviously belongs to the built-up type. It is perhaps four feet higher toward the center than around the lower parts of the margin. Bogs of any description are infrequent in this vicinity.

Belfast. The region about Quantabacook Pond, a dozen miles west of Belfast, abounds in bogs, many of them large. Some of them are slightly raised, but most of them are of the flat type.

Bangor. The Hermon Bog (Bastin and Davis, Locality 38), situated four miles west of Bangor, is a very fair example of a raised bog, definitely convex in surface contour and rising perhaps five feet from margin to center. It is about a square mile in area. The Chemo Pond bog, in the town of Bradley, about ten miles east of Bangor, was not seen but is judged from reports to be a large raised bog.

Old Town. Bordering Pushaw Lake, and mostly in the town of Old Town, is an immense bog many square miles in area (Bastin and Davis, Locality 41). In large part the bog surface appears flat, but in many places, as south of Mud Pond, it has been built up well above the level of the lake. Northwest of Old Town, bordering Birch Stream, in the town of Alton, for several miles, is an immense bog of the built-up type (Bastin and Davis, Locality 34); but the surface, so far as observed, is only slightly elevated above that of the clay flat which it overlies. The bog bordering Holland Pond in Alton (Bastin and Davis, Locality 33) rises several feet above the level of the pond. None of the bogs visited from either Bangor or Old Town compare with those seen farther east in the height to which the surface has been elevated.

Ellsworth and Franklin. Of the dozen bogs visited in this vicinity,

Garland's Heath, situated along the western edge of Union River about six miles north of Ellsworth, is a fine specimen of raised bog. It occupies an area of about a square mile and exhibits a conspicuously convex surface contour, rising more than ten feet vertically from margin to center. The presence of several other raised bogs in this vicinity is suggested from a study of the map. A number of these areas are specifically designated as "heath" (locally pronounced "haythe" or "hake"), a term which throughout eastern Maine is employed primarily (though unconsciously) with reference to raised bogs. For reasons which will be given later no attempt was made to visit these bogs.

Cherryfield and Columbia Falls. Four very characteristic raised bogs were visited in this section and a number of others were seen from a distance. One of those visited is a small bog, perhaps forty acres in extent, lying about three miles northeast of Cherryfield (Bastin and Davis, Locality 48). Its domed surface rises perhaps six feet from margin to center. A much larger raised bog is situated in the town of Deblois, about fifteen miles north-northwest of Cherryfield (Figs. 1, 2). Locally this is known as the Denbo Heath. Its area is unknown, but it must cover several square miles. In height it surpasses any of the bogs yet mentioned, its domed center rising fully eighteen feet (measured with hand level) higher than the margin. The Great Columbia Bog (Bastin and Davis, Locality 49) is probably still larger, covering altogether an area estimated at about five square miles along the Pleasant River. Its southern margin lies about six miles northwest of Columbia Falls, but it was also visited from the Cherryfield side—a somewhat longer journey. Regarding this area Bastin and Davis write: "Only the western portion of the bog . . . was tested, but test holes . . . failed to show more than three feet of mucky peat. It is possible, though hardly likely, that in other parts of the bog the depth of the peat may be greater." Yet less than two miles east of the area just referred to there is an immense raised bog which rises, if anything, to an even higher elevation than the Denbo Heath. The surface in places must be underlain by fully twenty feet of peat. No accurate measurements were taken. The fourth raised bog visited in this vicinity is situated a few miles northeast of the village of Columbia Falls. It is about one square mile in area and rises ten or more feet toward the center.

Machias. Several raised bogs were noted in this vicinity, but only one, a small one, was visited. For reasons which will be obvious presently attention was focused primarily on the flat bogs bordering lakes and ponds. The region east of Machias, between there and Lubec, was not explored, but a study of the map and of the Bastin and Davis report leaves little doubt that the raised bog is a common type in this section.

Calais. Along the western shore of Meddybemps Lake, ten miles southwest of Calais, there are several good-sized and very characteristic raised bogs. Similar bogs doubtless occur along many of the other lakes, in which this wild section of the country abounds.

General Distribution of Raised Bogs Along the Maine Coast

The observations set forth in the preceding paragraphs may be summarized as follows. (1) Raised bogs occur in greater or less abundance along much of the Maine coast east of Casco Bay. (2) They are most frequent and reach their best development east of Penobscot Bay. (3) In Washington County they are a common bog type and attain large proportions, frequently covering considerable tracts of country. (4) West of Penobscot Bay raised bogs are infrequent and, on the whole, poorly developed, although there is at least one conspicuous exception—the Great Sydney Bog. (5) How far away from the coast raised bogs, as a distinctive swamp type, occur has not been determined, but the Great Sydney Bog lies fully thirty miles inland.

It seems unnecessary here to say anything regarding the origin, vegetation, and other features of raised bogs in Maine. So far as observed, they seem to agree in practically every respect with the raised bogs of New Brunswick and northern Cape Breton, which have been amply described by Ganong[9] and the writer.[10]

Geographical and Local Distribution of Surgical Sphagnum

A few further remarks regarding the distribution of species and qualities of sphagnum suitable for surgical use may be of relevant interest. In so far as their geographical distribution is concerned, the assumed indicator significance of the raised bog, elsewhere suggested, seems to hold true. *Sphagnum papillosum*, the species best adapted to surgical requirements, is most widely distributed and most luxuriantly developed eastward; but it is further important to note that in its local distribution surgical sphagnum is by no means confined to the raised bogs. Quite the contrary. Good material is frequently found, indeed in considerable quantities, on the raised bogs, but here it is largely restricted to the margins of small ponds and to wet depressions and is scarce on the drier areas which comprise the greater part of the bog surface. The vast bulk of the sphagnum which grows on such a bog is worthless from a surgical point of view. Much of the best surgical moss and by far the largest quantities (this is particularly true of *Sphagnum papillosum*) are to be found in the wet, flat, "floating" bogs that border lakes and ponds; and these, nearly everywhere in eastern Maine, are of frequent occurrence. It was because of this discovery that more effort was not made to locate and explore the raised bogs. Unfortunately, from the surgical standpoint, the lumberman has brought about the destruction of many of the best areas of surgical sphagnum in eastern Maine. In their natural condition the "flowage" swamps, which border so many of the lakes and streams in this region, afford ideal conditions for the development of such moss. But *Sphagnum papillosum* in particular is extremely sensitive to any change in environment, and it has been

[9] *Op. cit.*

[10] Work cited in footnote 6.

drowned out over vast areas, in which, without question, it formerly abounded, by the damming of the streams and regulation of the water-flow. Similarly, in the great blueberry district about Cherryfield and Columbia Falls the repeated burning-over of the country in the interest of the blueberry crop has had a disastrous effect on the sphagnum.

Distinction between "Moss Bog" and "Heath" by Bastin and Davis

In conclusion, the writer cannot refrain from one other criticism of the Bastin and Davis peat report. In describing the various bogs and swamps the authors attempt to depict the character of the surface vegetation. Of particular significance in the writer's search for supplies of surgical sphagnum appeared to be the seemingly sharp distinction which they made between "moss bog" and "heath." Such a distinction, if accurately drawn, would have proved of the utmost assistance; for while a true moss bog is quite apt to contain surgical moss in quantity, a heath is equally apt to contain none at all. Experience soon showed that the distinction implied by Bastin and Davis in reality signified nothing, the "moss bogs" in all cases examined proving to be in no wise different from what elsewhere was more correctly described as heath. It may be suggested that, in general, a somewhat more accurate characterization of the botanical aspects of bogs on the part of peat investigators would add considerably to the scientific value of their work.

THE CIRCUMFERENCE OF GEOGRAPHY*

By NEVIN M. FENNEMAN
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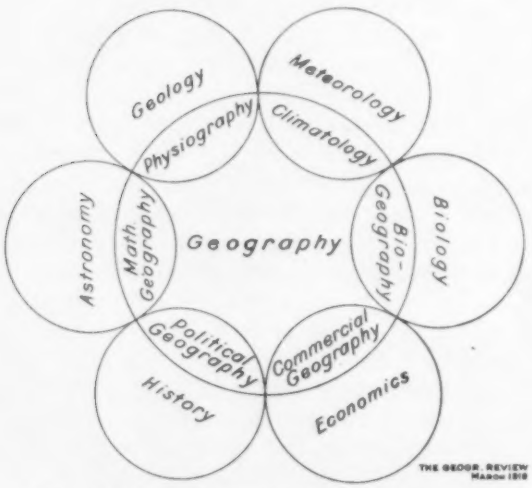

FIG. 1—This diagram expresses the fundamental conception that sciences overlap and that each one of the specialized phases of geography belongs equally to some other science. Such a diagram will be helpful if not construed too strictly. In a loose way the central residual part of the circle may represent regional geography. The diagram fails to show that physiography, climatology, etc., enter into regional geography by being treated with respect to their distribution instead of with respect to system and type. The number of overlapping sciences may be made greater or less according to the purpose in hand. [Cf. with the similar diagram in H. R. Mill's "The Realm of Nature" showing the relation of physiography to the sciences upon which it is dependent.—EDIT. NOTE.]

It is a peculiarity of geography to be always discussing and debating its own content—as though a society were to be organized for the sole purpose of finding out what the organization was for. This is not said by way of criticism; indeed this very paper is a continuation of the same discussion. The situation is, however, unique and can scarcely fail to be remarked by on-lookers from other sciences, who have no such doubts as to what their subjects are about.

The basis of this constant concern is not greed but *fear*. Geography wages no aggressive wars and seems to covet no new territory. In certain quarters it bristles with defense; but it is mainly concerned with purging its own house rather than spreading its borders. To rule out "what is not

* Presidential address at the fourteenth annual meeting of the Association of American Geographers, Baltimore, December 27 and 28, 1918.

geography'' would seem from the discussions to be much more important than to find and claim geography where it has been passing under other names. The constant apprehension is that by admitting alien subjects we shall sooner or later be absorbed by a foreign power and lose our identity.

It is probably unnecessary to point out that this is purely an American attitude. Geography of the European brand has no such concern for its own purity or fear of being absorbed. Scholarly geographic treatises from Europe may contain long lists of botanical names, or geological descriptions, or chapters which might be transferred bodily to monographs on economics or history.

To many American geographers this would seem like betraying their cause and selling their birthright. There is an implied dread that if geography accepts the work and uses the language of other sciences, geography itself will be dismembered and its remains be divided among its competitors. It is worth while to consider this possibility, and a rough plan is here submitted for a partition of geography's domain.

Suppose geography were dead, what would be left?

Proposed Partition of Geography's Domain

Geology might easily take over topography, including its genetic treatment, which is physiography—in fact, has never given it up. So also botany has never relinquished plant geography and ecology. Zoölogy does not forget the distribution of animals. Agriculture is now so specialized and so firmly entrenched that crops and their distribution, and their relation to all manner of factors, are studied without concern for geography. Meteorology has official standing in all civilized countries and could take care of climatology if geography were bankrupt. Moreover, meteorology is commercially employed and so has the satisfaction of being good for something beside being merely good ''to teach.'' So it is not afflicted with heart searchings regarding its own content. Mining is abundantly treated by geology and economics. The geographer only borrows from these, smooths out their details, and relates their results to something else. So economics deals with all other industries and with commerce, sometimes availing itself of the aid of chemistry and other sciences and always paying its respects to engineering.

A good part of what is termed political geography is covered also by history, and history would be more rational if it included still more. Political science, ethnography, etc., cultivate other parts of the geographical field and do it more exhaustively than does geography. Mathematical geography is, of course, pure astronomy, except for cartography, which is straight mathematics.

Thus it seems that, with geography dead, all its tangible effects would be claimed by relatives and the estate could be settled up. To say the least, this is disconcerting. The case is not made better by the reflection

that a large number of educated persons would see no reason for objecting to such a solution, provided only that geography were preserved for children up to the age when serious study should begin.

Dependence of Geography on Other Sciences for Its Material

At this point, while geography is confessing its limitations, it may as well be owned that, outside the field of exploration, the geographer is mainly dependent on others for his data. Aside from mere location, direction, and distance, almost every fact that he employs belongs quite as much to some other science. In so far as that fact represents a class, the entire class of facts is much more apt to be known exhaustively by the other science than by geography. If the geographer speaks of soils, the agriculturist knows more; if he speaks of mines, the geologist knows more; if the reference be to manufacturing, the economist's knowledge is more thorough, or at least more exhaustive; if the subject is the people, the ethnographer, sociologist, or economist has first-hand knowledge, and the geographer is generally a borrower; and so through the list. With respect to all these data someone else is the original student, the "authority," and the geographer is merely "informed." How often is a geographer called in as an expert, and in what lines? This question is not intended to suggest a wholly negative answer, especially in view of the fact that three of our members are at present in Paris on the staff of the Peace Commission and nearly one-half of our members have been engaged in some expert capacity during the war. It does not follow, of course, that all these were engaged as geographers.

Concession has here been made freely because scholars outside of geography know these facts to be true, and there is nothing to be gained by claiming more than we can defend. If geography is not worth while despite these admissions, its business may as well be wound up.

Need of a Synthetic Areal Science

Reverting now to our former figure of speech, what has geography to say of its proposed demise, the division of its tangible effects and the settling of the estate? The obvious question arises: Would the decedent stay dead? If he were to come to life again, the situation would be embarrassing as between him and his relatives. Assuming that after his decease each of the branches named above as contributing to geography does its task well with respect to Russia, for instance, is there any likelihood that a craving would arise for a synthetic picture of the whole or a critical study of inter-relations? If so, who would satisfy this craving, and who could paint the picture, and what would be its value or standing among scholars?

To begin with, the first question answers itself. There is not one chance in a hundred that ten years would go by without a conscious craving, and

an attempt to meet the craving, for a comprehensive view of the areal unit; and not one chance in a million that a century would elapse before such an interest would be the center of a new science. It matters no whit that all concrete data are already organized into other sciences, each more exhaustive and more critical with respect to its own data than the new science; it is absolutely certain that interest in the areal unit as such would clothe itself in appropriate form. It is the *areal relation*, after all, that makes geography.

To dwell on the kind of picture to be painted is not within our present purpose. In part it is a mere assembling of facts from diverse fields, facts joined together by the sole bond of a common locality. Whether we deride or apologize for this aggregation of facts, call it mere description, mere compilation, mere this or mere that (whatever it is, it is always "mere"), this humble task must still be performed before higher work is possible. Description bears the same relation to geography that narration does to history. There can be no sound philosophy in either, based on faulty narration or description.

But data thus assembled from diverse fields do not remain inert. They react on each other like chemicals to produce new compounds, that is, new truths. If the geographer knows less about soils and crops than the agriculturist, less of climate than the meteorologist, less of industry than the economist, less of society than the sociologist, he should still be supreme in this field of secondary compounds which cannot be formed by those who handle the data of one science only.

Value of "Scientific Trespass"

This point needs no elaboration here, but it is worth while recalling a passage from the presidential address of Dr. G. K. Gilbert before this association in this same city ten years ago. In explaining his choice of a subject, he announced himself as an advocate of the principle of "scientific trespass." "The specialist who forever stays at home and digs and delves within his private enclosure has all the advantages of intensive cultivation—except one; and the thing he misses is *cross-fertilization*. Trespass is one of the ways of securing cross-fertilization for his own crops, and of carrying cross-fertilization to the paddock he invades."[1] Gilbert might have added that the geographer is, or should be, the great insect that carries pollen from field to field.

It is not intended here to concede that geography does not concern itself at all in the first-hand search for data. Geographers have, for example, done much for topography. Light on land forms has been by far the leading contribution of American geography (though it is a question whether anyone has contributed to this subject who was not first trained as a geologist).

[1] *Science*, Vol. 29, p. 122.

Regional Geography the Core of the Science

Since geography *is to be*, it is quite right that physiography and climatology and the study of natural resources and even ecology should be of its family and bear its name, but the point here urged is that these are not the things which make geography *necessary* and *inevitable*. They may be necessary to it, but it is not necessary to them. All these might live with geography dead. All these and others belong to the regions of overlap, or ground common both to geography and to some other science, and, having two parents, would not be totally orphaned if one died; but the study of areas as before described belongs solely to geography and is, moreover, an only child. If these figures are somewhat mixed, it may be well to add in plain English that the one thing that is first, last, and always geography and nothing else, is the study of areas in their compositeness or complexity, that is *regional geography*.

It is not to be implied for one brief moment that physiography and the other branches named are not geography. They all become so when directed toward a geographic purpose. But without the touchstone of areal studies, there is nothing to make physiography other than geology, ecology other than botany, the study of natural resources other than economics.

There is, then, in geography this central core which is pure geography and nothing else, but there is much beyond this core which is none the less geography, though it belongs also to overlapping sciences. Here belong physiography and climatology, mathematical and commercial geography. Still, *the seeds are in the core, and the core is regional geography*, and this is why the subject propagates itself and maintains a separate existence. Without regional geography there is no reason why geography should be treated as a separate branch.

This emphasis on areal relations instead of on the "elements" which enter into such relations is, of course, not new. It comes to much the same thing in practice as Ritter's "home of man" or Davis's "physical element and human element" or this and that man's "responses" or Keltie's "science of distributions" or Hettner's "*dingliche Erfüllung der Erdräume*" (material filling of the earth's surface). Nor is it necessary, for the purpose here in hand, to point out that every element (topography, vegetation, climate, etc.) can be treated with reference to its distribution as well as with reference to its types. Such a treatment belongs to regional geography. It should, however, be noted that the study of the distribution of any one element by itself falls somewhat short of that *distinctive* geographic flavor which comes only when the various elements are studied in their inter-relations.

Cultivation of the Central Theme of Geography as a Safeguard Against Absorption by Other Sciences

Let us now go back to the fear above alluded to, that our subject is going to be swallowed by something else. Why this constant dread? The

situation at once suggests that we live too much on our borders and not enough in the center. If we dwell mainly in systematic physiography, why should not geology claim us as a vassal? If we live largely in commercial geography, we are in similar danger from economics; and why should it not be so? We can go round the circle with the same logic. A narrowly political geography of boundaries and capitals never had any reason for a separate existence apart from history.

If we are concerned for our independent existence no amount of fortifying our border will take the place of developing our domain. What we need is more and better studies of regions in their entirety, their compositeness, their complexity, their inter-relations of physical, economic, racial, historic, and other factors. No other science can swallow that and live.

Unnecessary Discrimination Against Geologic Terms

An illustration of warring on the border instead of farming our domain is found in our curious boycott of terms from other sciences even when needed to make the truth clear. It is not permissible to say that the Cumberland Plateau is co-extensive with the strong "Carboniferous" rock (even where that is true) or that the High Plains (of Nebraska and Wyoming) end at the north with certain late "Tertiary" formations. It is permissible to say that the Cumberland Plateau is as broad as certain "resistant" rocks, but a term which would enable us to locate those rocks on the geologic map is taboo. True, the plateau border can be made out on very large-scale and awkward-to-handle topographic maps, but such maps at best are empirical, while the geologic map is interpretative. Since when has geography become so reactionary? Why must we secrete the geologic map as medieval priests secreted the Bible?

In the debates concerning this point there has been the most curious oversight of common usage. "Carboniferous" and its like are dubbed "geologic time names." Such they are indeed, sometimes, just as "Carboniferous" might be the name of a man or a horse or a brand of shoe polish—all as irrelevant as geologic time—but the term also designates a body of material (in this case a system of strata) and, more important still, on the geologic map it stands for an *area*. "Triassic" indeed connotes geologic time, but the same word designates certain areas on the geologic map of the eastern United States. "Portage" is not only a Devonian epoch but a belt on the geologic map of western New York, a belt that must be spoken of and cannot be designated with equal clearness under any other name. In this manner, much use is properly made of geologic terms, not because they are names of epochs but because they are names of areas that force themselves on our notice by certain peculiarities, thus leading to rational explanations. For three-fourths of the United States the geologic map is beyond comparison the one most valuable map for interpreting topographic contrasts between adjacent areas. Why must

the words printed on it be classed as dangerous? The answer is: Geography is in danger of being swallowed, and self-preservation is nature's first law.

But "Cumberland Plateau" is a geographic term. How can the geologist say with impunity that the Carboniferous rocks are co-extensive with the Cumberland Plateau? Is not the danger mutual? Is his science not in danger of being swallowed by geography? The answer is: He is not afraid on that borderland where sciences overlap, because his own peculiar domain, which is not overlapped by geography or anything else, is too large and too well cultivated to admit of such fears. Our own safety lies in the same policy.

In our efforts toward self-preservation through purity, we have classed scientific terms as clean and unclean. The latter, such as Archean, Mesozoic, etc., cannot be touched without defilement. So we have built up a whole ceremonial by which we hope to be saved; but not so is salvation found. Its price to geography is no less than the diligent cultivating of its own peculiar field, the doing of something which the world needs and which no other science can do.

Animals have more than one way of evading the jaws of their competitors. The turtle is encased and puts up a good defense but is weak on the offensive. It is the same with the oyster. Others, like the squash bug, owe their safety to a peculiar flavor or odor. Still others specialize in modes of escape. But all such special provision belongs to the weak rather than to the strong. If geography will cultivate its own strength like the large mammals, it will not be necessary for it to encase itself like the oyster or cultivate the peculiar flavor of the squash bug to avoid being eaten.

In so far as there are frontiers between the sciences, let us have them ungarrisoned and let us have free trade. Let there be among sciences the same struggle for existence and law of survival that Darwin found among species. Then every field of study that answers to an intellectual need will have due recognition.

The Several Sciences Designated by Their Centers, Not by Their Circumferences

The subject announced for this brief address was "The Circumference of Geography." Presumably enough has been said to show that a science cannot be defined by its circumference. We may designate the center, and that should be enough. Everyone knows what botany is so long as we stay near the center, but where is its farthest limit? Far out in chemistry and medicine and geology, to say the least. And where is the limit of chemistry? Nowhere. Yet chemistry is not hard to define if it be designated by its center instead of by trying to draw its circumference. So the center of geography is the study of *areas*, generally, of course, in relation to man, for human habitation affords the most frequent utilitarian

reason for such study and is also the center of the greatest intellectual interest; but the comprehensive study of an uninhabitable region would still be geography.

It is not only the right but the duty of every science to develop all parts of its domain, but it is none the less true of all, as of geography, that their right to separate existence depends on their cultivation of that part of their field which is not overlapped by others. Let there be no misunderstanding; there is no intention of assigning more dignity to one part of the field than to another or of asking any man to turn aside from that which interests him to something else. There is no more inherent worth in a center than in a border. But some of us have a philosophic interest in viewing relationships, and in asking why the whole range of knowledge has grouped itself around certain centers, and what it is that keeps those centers, which have received names, somewhat permanent, and what the advantage is in grouping knowledge around one center rather than another.

Moreover, all of us have a very practical interest in seeing that our own work should not suffer by isolation. We all want our own work to have the advantage of connections, and it is greatly to our interest that somebody should cultivate certain central fields even though most of us work on the borders. The logic of events, if no other logic, has brought together in this association a group of men of rather diverse interests. We are disposed to think that this is not a mere chance but that something fundamental underlies our union. Much that interests the individual does not concern the whole; but we feel more or less intelligently that there is profit in this intercourse and we want the relation to be closer. If there is a class of studies that will make our separate fields more important and more interesting to others and enable us to profit more by our association, we want to know what that class is and to encourage it.

Beside those who are, first and last, geographers, our association contains geologists, topographers, geodesists, meteorologists, ecologists, zoölogists, geophysicists, historians, and economists. The list is not intended to be complete. We have joined ourselves together evidently expecting to find a common interest. Where is the common ground on which such diversity can meet? Interest in places, areas, regions is the common bond.

This quasi-philosophical study of relationships is therefore important to those whose privilege it is to direct research or to organize education. If men in such position decide with eyes open that physiography and commercial geography and anthropogeography and the rest should not be merely geology, economics, ethnography, etc., they must act accordingly. The character of these subjects can not be controlled by ceremonial law. The effective way is to set in the midst of them a great light, the light which comes alone from the comprehensive, rational, systematic study of regions.

THE YOUNG COASTS OF ANNAM AND NORTHERN SPAIN*

By W. M. DAVIS

The Coast of Annam

An explanatory account of the coast of northern French Indo-China, with many illustrations of its influence on human conditions, is given in a recent interesting article in *La Géographie*.[1] The leading features are as follows: The mountainous border of the Gulf of Tonkin has for the most part an embayed shore line of subrecent or recent submergence, fronted by a shallow sea bottom, which may be inferred to represent a submerged piedmont fluviatile plain composed of detritus from the well-dissected backland: but the coast of Annam to the south of the great delta of the Song-koi, or Red River, is now simplified from the initial irregularity due to its subrecent submergence by two series of longshore beaches, one emerged to a height of three or four meters and composed largely of shells, the other at sea level and of a more sandy composition. Both series of beaches stretch in long curves, concave seaward, between salient spurs or hills that advance from the mountainous backland as headlands or islands. The salients are a little wave-cut at the level of the beaches. The lower beaches are in groups of two or three members at the same level, one prograded in front of the other; the outermost beach appears to be still growing seaward. The upper beaches are not so well developed as the lower ones, presumably because they were formed on the uneven sea bottom of first submergence, while the lower beaches had better opportunity for growth, as they were formed on the off-shore sediments of the upper beaches.

The former lagoon floors behind the higher beaches now appear as low plains, which may be inferred to extend inland into the bays and coves of the initial shore line of submergence, at the heads of which delta plains should stand at the same altitude as that of the emerged beaches. The low plains are drained by wandering rivers on their way from the mountains to the sea; the rivers are presumably entrenched in the former bay-head delta plains. The lower beaches enclose marshy lagoons. In striking contrast to the simplified coast of Annam, the coast of Tonkin, north of the great delta of the Red River, is still intricately embayed; the contrast is explained by assuming a recent and gentle tilting of the land on an axis trending northwest-southeast through the delta, whereby the earlier and greater submergence of the whole coast is continued and slightly increased to the northeast but is reversed into a slight emergence to the southwest.

* A continuation of the series "Notes on the Description of Land Forms" which appeared in the *Bull. Amer. Geogr. Soc.* as follows: Vol. 42, 1910, pp. 671-675, 840-844; Vol. 43, 1911, pp. 46-51, 190-194, 598-604, 679-684, 847-853; Vol. 44, 1912, pp. 908-913; Vol. 45, 1913, pp. 360-364, 518-521; Vol. 46, 1914, pp. 36-42, 524-527.

[1] E. Chassigneux: Plages soulevées dans le nord de l'Annam, *La Géographie*, Vol. 32, 1918, pp. 81-95.

How the Inhabitants Live

The natives of northern Annam occupy by tradition and therefore by preference the lower beaches and the marshy lagoons, where their villages are surrounded by hedges of bamboo; the marshes are cultivated in rice fields. Where the upper beaches are occupied, the dryness of their shell-bank soil, in which bamboo will not grow, leads to the use of reeds and thorny bushes for village hedges; here the rice fields of the marshy lagoons are replaced by plantations of mulberry trees, the leaves of which serve as food for silk worms. Wells on the elevated beaches take the place of tanks and pools in the lower marshes; the cemented shell stone, quarried from a small depth, is used for houses and pagodas. The mountainous backland is thinly populated.

Desirability of Presenting General Features First in a Regional Description

The article from which the above abstract is made deserves praise because it enables the reader to visualize the landscape that it describes and to understand how the inhabitants live upon it. But the reader's task would have been easier if certain details, added above as inferences, had been explicitly announced. The reader's task would have been still more facilitated if the larger features of the region, which are placed first in the abstract, had not been postponed to the last pages of the article; for in that case the detailed accounts of the raised beaches which occupy the first pages of the article, where they stand unrelated to their natural attachments, could have been described after the larger features of the landscape to which they are manifestly subordinate. It is true that, to an observer on the ground, the elevated beaches may, for one reason or another, take precedence of other, larger features, particularly if they are selected as objects of special study and if shells are collected from them with the result of discovering that the species there preserved are the same as those still living in the neighboring sea, as is here the case; but when it comes to presenting the geographical results of such a study to readers at a distance, much may be said in favor of describing the general features of the region first, so that when the details are presented they may fall into their properly subordinate position, however great their importance may have seemed in a near-by view.

Absence of Coral Reefs

It is singular that the headlands and islands of this torrid coast of submergence have not been fringed with coral reefs. The reason for the absence of reefs may probably be found in the shallowness of the adjoining sea floor, from which, as in the shallow Java Sea farther south, the sediments are swept landward to aid in the formation of beaches between the

headlands, thus making the headland waters prevailingly turbid; for corals will not thrive where sediments are swept about.

The Bay of Santander

A recent article in the geological series of the *Trabajos del Museo Nacional de Ciencias Naturales* of Madrid,[2] like other articles in the same series, bears many marks of an awakening to modern morphological methods, which Spanish geographers have long disregarded. The Bay of Santander, one of several re-entrants on the northern, or Cantabrian, coast of Spain, is here analytically examined as to the geological history of its origin; the conclusions are set forth in such a manner that a concise explanatory account of the district may be composed from them. Although the author does not take this final geographical step, he might easily have done so if his object had not been gained without it, for he shows abundant familiarity with good physiographic procedure. His results may be summarized as follows:

The Cantabrian coast, composed of folded sandstones and limestones with east-west trends, slopes from a mountainous backland to a piedmont bench, 10 or 15 kilometers in width and 60 or 70 meters in altitude, which is interpreted as a platform of marine abrasion that was cut while the region stood at a lower level than now. Emergence then placed the platform at a greater altitude than it has at present, whereupon it was maturely dissected, so that, while a general view shows the residual uplands lying at accordant levels, many branching valleys are widely opened and the inter-valley hills have well-rounded slopes. A submergence then occurred, whereby the sea gained access to the maturely branching valleys and converted them into *rias*, or branching bays, some of which reached almost as far inland as the mountains; but this was so long ago that the inner branches of the bays are now largely filled with alluvium and converted into delta plains and tidal marshes, while the outer bays are shoaled and their shores are somewhat cliffed, leaving little valleys suspended above the present beaches. The process of *ria* filling is thought to have been aided by a slight emergence hereabouts, in contrast to which a continued submergence has prevented a corresponding aggradation of the larger *rias* in the Galician coast, farther west.

Desirability of Additional Information

Further information is desirable regarding certain items. First, the form of the spur ends where the mountains of the backland join the uplands of the piedmont bench should be examined; for if the bench be truly a platform of marine abrasion, cut back to a width of 10 or 15 kilometers, the steepened ends of the spurs ought to stand in line as parts of the

[2] J. Dantín Cereceda: Evolución morfológica de la Bahía de Santander, *Trab. del. Museo Nacl. de Cienc. Nat.: Ser. Geol. No. 20*, Madrid, 1917.

series of cliffs that must have risen from the maturely retrograded inner border of the platform: but if the upland be a dissected peneplain, the spurs ought to decline gradually and their ends should not stand in line. Second, the possible occurrence of marine gravels on the least dissected inter-valley uplands should be searched for. Third, the relation of the valleys to the truncated strata needs consideration; for if the uplands truly represent a platform of abrasion, then the rivers which took possession of the presumably gravel-covered platform when it emerged would have incised their superposed courses without regard to the underlying hard and soft beds; while if the dissected upland be an uplifted peneplain, the valleys should show a considerable measure of adjustment to longitudinal weak belts. Fourth, the pattern of the outer coast, regarding which little is said, merits some attention; for, although the occurrence of low cliffs in the bays suggests the occurrence of higher cliffs on the outer coast, nothing is said about them.

Geographical Instead of Geological Form of Presentation

The results presented in this morphogenetic inquiry are set forth in historical order, in which the past tense of verbs, reproduced in the above abstract, is characteristically used. The results might be easily translated into geographical form in which the present tense is preferable, as follows: Santander lies on an outer bay-shore of a largely aggraded *ria*, which, like its neighbors, occupies a partly submerged valley system in an uplifted and maturely dissected platform of marine abrasion, 10 or 15 kilometers in width and 60 or 70 meters in altitude, at the base of the Cantabrian Mountains of northern Spain. Or: A belt of deformed sandstones and limestones, which rises in most of its width to form the Cantabrian Mountains of northern Spain, is continued along its seaward border in an uplifted and maturely dissected platform of marine abrasion, 10 or 15 kilometers in width and 60 or 70 meters in altitude, the valleys in which are occupied by branching *rias*, largely aggraded in their inner parts and somewhat shoaled by deposition and widened by cliffing in their outer parts: on the northern side of an outer bay in one of the *rias*, which opens northeastward and is imperfectly filled with alluvium, lies Santander.

As in all condensed explanatory descriptions, the qualitative statements regarding the Annam and Cantabrian coasts, given above, should be supplemented by detailed quantitative statements, in order to bring the local facts clearly before the reader: but the quantitative details are best apprehended by a mature reader if they are introduced by a concise qualitative summary.

The Maturity of Coasts

The partly submerged coasts described in both of the articles above reviewed are stated by the authors to be in the stage of "maturity." It is gratifying to perceive in the use of this term that the systematic evolu-

tion of coasts, during which they pass through a well-defined succession of forms in orderly sequence, is recognized as of value in physiographic description; but it is questionable whether "maturity" is the best term by which to designate the stage of evolution reached by the coasts in question. An embayed coast must, if it stand still through an entire cycle of marine abrasion, very soon reach the stage of slight headland cliffing and partial bay filling; it must somewhat later reach the stage of complete headland truncation, when the steep cliffs, usually of increasing height, are cut back nearly or quite as far as the initial bay heads; and it will at a much later time reach the stage of far-retrograded, slanting cliffs of moderate height, when the slowly retreating shore line has receded well into the original interior highlands, which will then have lost a good share of their initial height by general degradation. A complete cycle of marine abrasion may thus be divided into early, advanced, and late, or young, mature, and old stages of evolution; and it is in this way that the marine cycle has been divided by those who have introduced organic terms for its description. In accordance with this scheme of nomenclature, the present stage of the Annam and Cantabrian coasts should be described as "young."

Whether a scheme of nomenclature which is based upon terms of organic growth shall be adopted for the description of inorganic land forms is perhaps still an open question; but until some other scheme is announced, it is desirable that authors who characterize slightly modified coasts of submergence as "mature" should give notice that they are departing from the meaning which has heretofore been given to "maturity" in the description of coastal forms and should at the same time define the other stages of coastal evolution which they propose to designate as "young" and "old."

GEOGRAPHICAL RECORD

AMERICAN GEOGRAPHICAL SOCIETY

Meetings of February. An inter-monthly meeting of the American Geographical Society was held on Tuesday evening, February 11, at the Engineering Societies' Building, 29 West Thirty-ninth Street. President Greenough presided. The lecturer of the evening was Mr. Henry Woodhouse of the Aero Club of America; he addressed the Society on "The Trail of the Airplane." The lecture dealt with the function of the airplane in exploration and in commerce as well as in war and was illustrated by motion pictures of exceptional merit. In addition to the article on the use of the airplane in exploration in the present number of the *Geographical Review*, Mr. Woodhouse contributed an article on aërial transportation, it will be recalled, over a year ago (Aëronautical Maps and Aërial Transportation, Vol. 4, 1917, pp. 329-350).

A monthly meeting of the Society was held on February 25. President Greenough presided. He submitted the names of 13 candidates for Fellowship, each of whom had been approved by the Council, and they were confirmed as Fellows of the Society. Thereupon Dr. Alfred G. Mayor, director of the Department of Marine Biology of the Carnegie Institution, addressed the Society on "The South Sea Islands." In his lecture he drew upon the experiences of his various zoölogical trips to the Pacific—to the Fiji Islands in 1897, on the *Albatross* in 1899-1900, to Torres Straits and New Guinea in 1913, and to Samoa in 1917.

NORTH AMERICA

The War Work of the United States Geological Survey. Summaries of the services rendered by science in the conduct of the war (see G. K. Burgess: Application of Science to Warfare in France, *Scientific Monthly*, October, 1917, pp. 289-297, and J. S. Ames: Science at the Front, *Atlantic Monthly*, January, 1918, pp. 90-100), make it evident that of all branches few have been of greater importance than the so-called earth sciences. While it is an every-day observation that geography has come into its own more fully than ever before, it is clear, too, that geology, also, has demonstrated its practical utility in a new and striking manner. In a series of "discussions" appearing in *Economic Geology* (March, 1918, pp. 145-146; June, 1918, pp. 314-315; and July, 1918, pp. 392-399) the important co-operation of the United States Geological Survey in government war work is dealt with. A note in the *Geographical Review* (Vol. 5, 1918, p. 73) has already called attention to some phases of this contribution, but the Thirty-Ninth Annual Report (for the fiscal year ended June 30, 1918) of the Survey itself, recently issued (163 pp.; Washington, D. C., 1918), contains a comprehensive statement of the signally valuable service rendered.

Immediately upon this country's entry into the conflict each branch of the organization directed its activities, so far as possible, to assisting in the prosecution of the war. The list of their multitudinous achievements makes a notable record. The Geological Branch began an exhaustive investigation into the mineral resources of the nation, instituting a painstaking search for new deposits, particularly of those materials needed to supply military demands. This search was not limited to the territory of the United States, but was carried on in other parts of the continent and the West Indies from which essential minerals might be obtained. To supplement this work a compilation of statistics regarding the mineral resources of the world was undertaken. The results of these researches have been partially published, in the press and in the various monographs issued by the Survey during the year. In addition to their importance as war work, they will form, when completed, a valuable contribution to pure science.

In order to ascertain the extent to which electricity might be substituted for coal and other fuels, the Water Supply Branch instituted a country-wide survey of the water power available. This survey is still going on. Its completion should mark a most notable advance toward the development of the hydro-electric resources of the nation, bringing the United States into line with the many other countries that are making a systematic effort to utilize their long-neglected water power. This division also contributed toward a thorough investigation of water supplies for training camps, their drainage and sanitation, their protection from floods, and the springs available for army use in the desert regions.

In the Topographic Branch, though its force was severely drawn upon for oversea service, extensive work was carried on in military mapping. Camp sites were surveyed, aviation fields laid out, locations for munition plants selected, artillery ranges plotted, while motor truck routes and airplane courses were mapped in many parts of the country. In addition to the regular topographic work, which in the fiscal year ended June 30, 1918, added 21,955 square miles to the area so surveyed, bringing the percentage of the total area of the country mapped to 42.2, special military mapping of regions selected by the War Department, mostly along the borders of the United States, covered 22,579 square miles.

To illustrate the war work carried on by the Survey detailed graphs are published in the report referred to. These diagrams reveal the fact that nearly every department of the government and many of the subordinate bureaus, boards, divisions, commissions, and administrations were served in some important capacity by the war-time activities of the Geological Survey.

Free-Air Data and the Cold Winter of 1917-18. The development of aviation for commercial purposes will inevitably lead to a more extended investigation of the meteorological conditions of the free air, as well as to the more detailed study of the data which are already available. Both meteorology and aviation will profit by this increasing emphasis upon what is, in many respects, the most important aspect of the science of the atmosphere, viz. that which concerns the conditions above the surface up to the highest flying levels and beyond. In eight *Supplements* to the *Monthly Weather Review* (Nos. 3, 5, 7, 8, 10, 11, 12, 13), the data obtained at the Drexel (Nebr.) Aerological Station, at Fort Omaha (Nebr.), and at the Ellendale (No. Dak.) Aerological Station have been published in full and discussed.

The two most recent *Supplements*, Nos. 12 and 13 (1918), contain the data obtained at Drexel and Ellendale from January to June, 1918, which are discussed by Willis R. Gregg; a description of the Ellendale station and notes on kite-flying by V. E. Jakl, and a study of the free-air temperatures during the cold winter of 1917-18 by Willis R. Gregg. The last-named discussion, while it rests upon incomplete data, brings out some facts of general meteorological interest. It is suggested that the cause of the remarkable temperature abnormalities that prevailed during the winter of 1917-18 is to be sought in the movements of the high- and low-pressure areas across the country and in the resulting location of the mean barometric maxima and minima. The pressure distribution in December, 1917, showed a continental anticyclone stretching from North Dakota southeastward to Illinois and a region of low pressure over the extreme Northwest. This pressure distribution favored low temperatures in the East and high temperatures over Western sections.

In January, 1918, also, the mean pressure distribution was similar, as were the temperature abnormalities. The pressure was, however, higher over Oregon and northern California, and this to some extent neutralized the influence of the high on the eastern slope of the Rocky Mountains. Hence the temperatures over the Northwest were not much above the average. In general, the southward movement of the lows during the winter drew in more cold air than usual from the north, and this resulted in large negative departures.

R. DEC. WARD

SOUTH AMERICA

The Petroleum Resources of South America. Though South America now ranks next to last among the petroleum-producing continents (John D. Northrop: Petroleum in 1916, *Mineral Resources of the United States for 1916*, Part 2, pp. 679-886, U. S. Geol. Survey, Washington, 1918) it seems likely that she will eventually occupy second or third place if the resources of her various fields fulfill present expectations. These deposits have been attracting much attention of late years, partly because of their latent possibilities, partly because, lying outside of the sphere of political domination of the great consuming nations, they afford a more independent source of supply.

Among the most comprehensive and authoritative discussions of the subject is a recent paper by F. G. Clapp entitled "Review of Present Knowledge Regarding the Petroleum Resources of South America" (*Bull. Amer. Inst. Mining Engineers*, No. 130, Oct. 1917, pp. 1739-1791). The author, writing from a wide acquaintance with the literature on the subject, a knowledge of the comparative geology of petroleum fields, and a practical familiarity with the problems of exploitation, presents a systematic treatment of the oil resources of the continent, productive and potential.

Five geological belts of oil-bearing rocks in South America are recognized. The first, the Caribbean, is in many respects a continuation of the Gulf Coastal Plain of North America and includes the areas being studied by petroleum companies in Colombia

and northern Venezuela. Hon. Preston McGoodwin, in *Commerce Reports* for October 7, 1916, describes in detail the status of oil development in the latter republic at that date. For notes on the more recent developments in these countries see *Commerce Reports*, July 3, 1918, p. 36, and July 25, 1918, p. 329.

The second belt, lying between the Andes and the Pacific, corresponds to the similarly situated oil regions of North America. In this belt are located the already productive fields of Peru, at Zorritos, Lobitos, and Negritos. This is still the leading oil region of South America, having produced, in 1917, 2,533,417 barrels (see *U. S. Geol. Survey Press Bull. No. 382*, Sept. 1918). More than half of Peru's production comes from the Negritos pool.

The third belt is situated about the Orinoco delta, where asphalt lakes, supposed to indicate the presence of large underlying petroleum deposits, have been worked for many years, but where little oil development has as yet taken place.

The Andean district, the fourth in the series, extends along the eastern slope of the Cordillera, from Colombia to Patagonia. None of these fields are producing in exportable quantities, but several are considered of great promise, particularly that of the Santa Cruz region in eastern Bolivia.

The fifth belt, that of the South Atlantic coastal plain, contains the second field in South America which is actually producing on a commercial scale. Operations in this field are described in *Commerce Reports* for June 2, 1917. According to the *Geological Survey Press Bulletin* cited above, the production of petroleum in Argentina during the year 1917 was 1,144,737 barrels. All of this was yielded by the wells at Comodoro Rivadavia, other sources being negligible. The Argentine publication *Revista de Economía y Finanzas* (Sept. 5, 1918) estimates the total production for the year 1918 at 1,272,114 barrels (202,251 cubic meters), thus showing a substantial gain over 1917, of 127,377 barrels. This increase is due to the greater number of wells now in operation. All of the work done in this field is conducted by the Argentine government. (See also Fernando de Pedroso: Informe sobre el estado de la exploración y explotación de los yacimientos petrolíferos del distrito minero de Comodoro Rivadavia, *Direcc. Gen. de Minas, Geol. e Hidrol. Bol. No. 6, Serie A (Minas)*, Minist. de Agric., Buenos Aires, 1915, and other publications by the same office.)

A large part of South American petroleum is of asphaltic or mixed bases, being particularly suitable for fuel oil. In view of the scarcity and high cost of wood and coal in many of the most densely settled sections of the continent this petroleum supply will probably become of great importance in furnishing fuel for ships, railways, and factories.

Reopening of the British Guiana Research Station of the New York Zoological Society. In his introduction to the volume "Tropical Wild Life in British Guiana" (see *Geogr. Rev.*, Vol. 6, 1918, p. 460) the late Colonel Roosevelt said: "The establishment of the Tropical Research Station in British Guiana by the New York Zoological Society marks the beginning of a wholly new type of biological work, capable of literally illimitable expansion. It provides for intensive study, in the open field, of the teeming animal life of the tropics."

Every member of the staff of this station has been serving in the American army during the war, and, now that hostilities have ceased, an expedition has started for British Guiana to resume scientific investigation. The financial support necessary for this undertaking has been provided by the New York Zoological Society through the generosity of five members of the Board of Managers, Col. Anthony R. Kuser, C. Ledward Blair, Andrew Carnegie, George J. Gould, and A. Barton Hepburn, and the requisite leave of absence has been granted to the staff in the service of the Society. On February 26 three of the staff sailed for the south: William Beebe, Director; Alfred Emerson, Research Assistant; and John Tee-Van, Artist and Preparateur. Their outfit included the most complete laboratory equipment ever taken to the tropics, and the station was reopened under most auspicious conditions at Katabo, its permanent headquarters. This is a most beautiful site, shaded with hundred-foot bamboos, at the very edge of the jungle, and directly at the junction of two great rivers, the Mazaruni and the Cuyuni. Here several bungalows and a large laboratory await occupancy, and here it is hoped that many of our scientific men may find a stimulating field for the prosecution of their particular lines of research.

While each member of the staff will undertake some special investigation, yet it is the intention of the Director that all shall unite in some definite ecological study of the interrelations of certain groups of organisms, in the hope of gaining some insight into more general problems of evolution, of adaptation, of survival. The results of all the studies will be published by the Zoological Society in the second volume of "Tropical Wild Life."

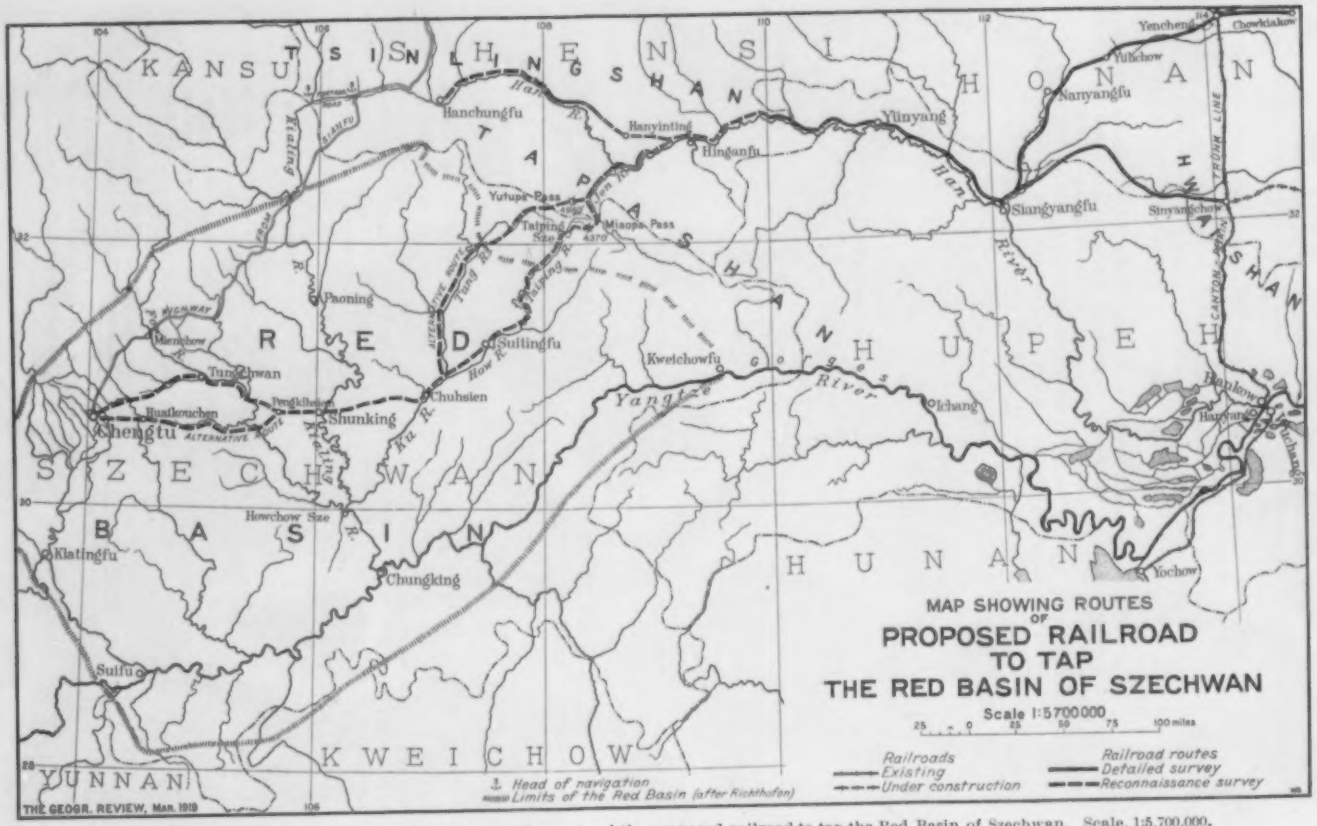

FIG. 1—Sketch map of west-central China showing the route of the proposed railroad to tap the Red Basin of Szechwan. Scale, 1:5,700,000.

Three years ago Colonel Theodore Roosevelt visited the station and wrote of its functions and activities. This year Professor Henry Fairfield Osborn, President of the Zoological Society and of the American Museum of Natural History, accompanied the expedition, spent several weeks in observing the unique conditions under which the undertaking is carried on, and advised as to its extension and future.

ASIA

A Proposed Railroad to Tap the Red Basin of Szechwan, China. Proverbial among the productive and populous regions of China is the Red Basin of Szechwan. On its area of 20,000 square miles is concentrated the major part of the vast province's 50,000,000 or 60,000,000 inhabitants. A maximum is reached in the Chengtu plain, where the gently sloping surface permits an intensive development of irrigation; here Richthofen ("Letters, 1870-1872," Shanghai, 2nd edit., 1903) estimated the density at 1,500 per square mile. But elsewhere, too, on the extremely accidented surface cultivation is carried to a high pitch by terracing. Rice, wheat, maize, and bean fields cover the slopes of 30°. Advantage is taken of differential erosion to cultivate parallel strips on slopes of 60°: indeed one may say there is cultivation "where it is possible for a man to stand and work." Hemp, sugar, tobacco, and oranges are among the leading products of the country. The brine wells of the basin are famous; the red rocks are underlain by coal, and the existence of other minerals is known. Yet today the trade of the rich and populous province is small; it is largely confined to salt and such valuable commodities as silk and—formerly—opium. The customs returns from the treaty port of Chungking did not greatly exceed $20,000,000 in 1913 (*Dipl. and Cons. Repts. No. 5378*, London, 1914). Szechwan has no adequate outlet for its wealth.

Richthofen's Red Basin, a plateau of an average elevation of some 1,000 to 2,000 feet, is entirely rimmed by comparatively lofty mountain ranges. On the east the confused mountain mass of the Tapashan, 120 miles broad, separating Szechwan from Hupeh, is forced by the Yangtzekiang; the river, here flowing with strong current and broken by difficult rapids, forms the single gateway to the interior. Dangers of navigation put a toll on trade estimated at an annual loss of 20 per cent of the cargo. Until quite recently a favorable winter journey from Shanghai to Chungking took a month: against the summer floods it might be drawn out to three or four. In 1910, however, a regular steamship service was inaugurated with one vessel plying on the river during the summer months. Since 1914 the service has been extended to a fleet of ten vessels. Their success has been somewhat variable, and steam navigation on the upper Yangtze must still be regarded as in an experimental stage (see: La navigation du Yang-tseu entre Han-k'eou et le Sseu-tch'ouan, *Ann. de Géogr.*, Jan., 1918, p. 73; see also Report on Chungking, *China Maritime Customs Statist. Series Nos. 3 and 4 (Returns of Trade and Trade Repts.)*, 1916, Part 2, Vol. 2, pp. 421-426). Of land highways there are none. A railroad paralleling the Yangtze (Four Power Concession) has been projected, but its construction would be costly and difficult. More feasible is the Chinese Government Railroad plan of entering Szechwan from the north, from the Han River valley. Partial surveys have already been made for a road along this valley that will connect at Sinyangchow on the Pekin-Canton trunk road with the line now under construction from Nanking, with an alternative route connecting with the Pekin line farther north at Yencheng and originating some 36 miles to the east at Chowkiakow, its present eastern terminus. In the west the line leaves the Han River at Hinganfu and proceeds over the Tapashan to Chengtu. A branch has also been surveyed up the Han River from Hinganfu to Hanchungfu, where it reaches the two main routes by which the Red Basin has hitherto been accessible from the east and north: (1) the old historic highway from Sianfu, the capital of Shensi, to Chengtu and (2) the waterway up the Han to the head of navigation (a few miles below its source) across a land portage of 45 miles to the head of navigation on the Kialing and thence down this river to Paoning and Chungking. Various articles on the proposed line have appeared in the *Far Eastern Review* of Shanghai: the route from Chowkiakow to Hanchungfu was described in the February, 1917, number (pp. 321-332, with a railway map of China, 1:7,750,000 [marked 1:6,000,000 on original]) and the eastern section, from Chowkiakow to Siangyangfu, more in detail in the June, 1917, issue (pp. 492-494), while the whole line from Sinyangchow to Chengtu was discussed in the July, 1918, issue (pp. 249-263, with map, 1:5,000,000). The following notes and accompanying map are based on the unpublished reports of reconnaissances made in 1917 by two American engineers under the direction of the Chinese Government.

To enter the Red Basin from the northeast it is necessary to cross the broken, moun-

tainous country of the Tapashan, rising to a general elevation of 6,000 feet and watered by numerous deep-cut streams draining respectively northeast and southwest. The direction and character of the stream valleys and the elevation of the passes are the factors here controlling railroad construction. Careful survey of the block of country between longitudes 108° and 110° E. and latitudes 31°50′ and 32°50′ N. has shown the existence of two passes of comparatively low elevation. From Hinganfu both are approached by the Jen River, the most practicable route leading out of the Han valley. The lower, Miaopa Pass, 4,370 feet, gives access to the Taiping valley; the Yutupa Pass, 4,980 feet, to the twin stream Tungkiang. The two rivers unite some distance above Chuhsien, from which point the projected railway will run in a nearly direct line to Chengtu via the main trail through a populous country. West of Chuhsien villages of 100 to 600 families, interspersed with smaller ones, appear every four or five miles, and on the main river crossings are such important centers as Shunking and Tungchwan. In the western portion an alternative route is under reconnaissance; it would, however, encroach on the Four Power Concession at Huaikouchen. The alternative routes via the Taiping and the Tungkiang valleys differ little in length. The former has the advantage by 15 miles and will require a shorter summit tunnel, but its summit gradients will be steeper (20 miles of 2 per cent gradient against 12 of 1.8 per cent, with possibilities of reduction to 1 per cent via the Yutupa Pass). Coal and iron are known along the Taiping, and the valley includes a few more large centers. Reconnaissance to the west has proved the restricted choice of routes, and not only does this apply to general direction; in detail the line that will be built must closely follow the winding course of the river selected. By the Yutupa Pass there will be a three-mile tunnel, and a three-thousand-foot bridge will be needed to cross the broad river at Shunking; but otherwise no special engineering difficulties are expected.

The line as thus designed will intercept the junk traffic of the chief rivers navigable in varying degree. For four months of the year the Han River is open to 10-ton junks to Hanchungfu, center of a plain rivaling that of Chengtu in fertility and wealth (see the excellent Commercial Report on Shensi Province, *Board of Trade Journ.*, Jan. 31, 1918). Tungchwan and Shunking are reached by 20-ton junks, and by construction of a branch line from the latter town to Chungking a good deal of the Yangtze traffic might be diverted. The branch line required would be 120 miles long and would pass through the important coal-mining center of Howchow Sze. With present transportation practically limited to junks and coolie carriers it is difficult to arrive at an estimate of probable railroad traffic. Of the productivity of the soil there is no question, and what is known of the mineral resources is encouraging. Coal outcrops at points along the Han, Jen, and Taiping Rivers and elsewhere in the Red Basin. At present it is only mined at such points where it can be worked from simple adits, but it is believed that the entire basin is underlain by coal-bearing rocks. Iron is found near Taiping Sze, asbestos near Hinganfu, copper and the precious metals west of Chengtu.

Probable traffic on the line after due time for establishment—at least one year—is thus estimated by the surveyors: freight crossing the Jen Ho summit going east, 20,000 tons per day; going west, 10,000 tons per day: passenger traffic, about 95 per cent third class, 1,500 people per day per mile each way.

POLAR REGIONS

A Proposed Polar Expedition by Airplane. Late in December of last year the plans were announced (e.g. *New York Times*, December 29, 1918) of a proposed polar expedition by airplane under the leadership of Captain Robert A. Bartlett, the well-known Arctic navigator, and with the support of the Aero Club of America. The plans call for the despatch of a vessel in June of this year to Etah, Greenland, which will serve as one of the main bases. From here a flying base is to be established at Cape Columbia, on the edge of the Polar Sea. Bases are also to be established at Cape Chelyuskin, Siberia, or on Nicholas II Land to the north of it, and at Wrangel Island. Within the triangle defined by these three points lies the greater part of the totally unexplored part of the Arctic. The expedition will be equipped with a large plane, capable, for instance, of making the flight of 1,133 miles from Cape Columbia to Cape Chelyuskin, and several scout planes for shorter flights from the bases, such as from Cape Columbia to the Pole, a distance of 413 miles. In addition it is planned to send a small oil-burning vessel into the Polar Sea from Bering Strait and force her northward far enough so as to avoid the westward coastal current which carried the *Karluk*, in the hope that she will drift across the Pole and emerge on the European side. The expedition is planned to take three years.

GEOGRAPHICAL NEWS

Personal

Mr. C. E. Akeley of the American Museum of Natural History addressed the Aeronautical Society of America on November 26, 1918, in New York City, on "Exploration in British East Africa." Mr. Akeley dwelt upon the part that the airplane will play in the future work of exploration in this region.

Dr. J. G. Bartholomew, head of the well-known Edinburgh cartographic institution of that name, was awarded the Helen Culver Gold Medal by the Geographic Society of Chicago last November.

Professor G. G. Chisholm of the University of Edinburgh was awarded the Helen Culver Gold Medal by the Geographic Society of Chicago last November.

Dr. J. J. Galloway read a paper on February 17 before the New York Academy of Sciences entitled "Notes on the Geology and Physiography of Yucatan, Mexico."

Professor C. L. Poor of Columbia University addressed the New York Academy of Sciences on December 2, 1918, on "Recent Advances in the Art of Navigation." Modern methods of finding one's position at sea and in the air were explained, and the new "line of position computer" and other instruments were exhibited.

M. Jules Rouch has been awarded the Victor Raulin prize of the Paris Academy of Sciences for his work in meteorology, atmospheric electricity, and physical oceanography.

Professor Frederick Starr of the Department of Anthropology in the University of Chicago addressed the Geographic Society of Chicago on January 10 on "The Mountain Monasteries of Korea."

Professor Bailey Willis of Leland Stanford Junior University addressed the Psysiographers Club of Columbia University on November 22, 1918, on "South America, Its Countries, Its People, Its Industries, and Its Relation with the United States."

GEOGRAPHICAL PUBLICATIONS

(Reviews and Titles of Books, Papers, and Maps)

For key to classification see "Explanatory Note" in Vol. II, pp. 77-81

NORTH AMERICA

UNITED STATES

North-Central States

SALISBURY, R. D., AND H. H. BARROWS. **The environment of Camp Grant.** 75 pp.; maps, diagrs. *Illinois State Geol. Survey Bull. No. 39.* Urbana, 1918. 10 x 7.

According to the letter of transmittal by the chief of the State Geological Survey and the "Foreword" by the authors, this bulletin evidently has been written to show concretely the influence of geographic factors in the solution of many of the problems of the battle field. It was planned for the men in training at Camp Grant and hence discusses the region in which the camp is located.

The bulletin is divided into four parts, viz. Physical Features, Points of Military Significance, The History of the Land, and Nature and Man in the Rockford Region. The text is illuminated by diagrams and maps, including four folded topographic sheets, 1918, "surveyed in co-operation with the War Department and the State of Illinois." These include the Rockford, Belvidere, Kings, and Kirkland quadrangles. A few of the black-and-white maps show no meridians and parallels. Such basic controls in map construction ought never to be omitted. The bulletin is written for the most part in textbook style, making it convenient for study by classes of men in training, if that should prove desirable.

The bulletin is an adventure in some respects, for it is a direct attempt to offer in elementary form a geographic interpretation planned to be also of practical value to the military man. The first two chapters point in the right direction. The relation of movements of underground water to problems of trenching, the location and selection of materials for road building, the location of well sites with respect to the assurance of an adequate supply of good drinking water—these and many other important problems are clearly presented and must impress the soldier with the large advantage which a knowledge of the principles of geography and geology will offer him and his comrades. The application of the third chapter seems in part open to question. For example, one wonders of what significance it is that several ice sheets should have covered the region or that the surface relief "would be increased 250 feet" if the drift were removed. The fact that the region was glaciated is the vital point. The battle or campaign occurs on the present and not on the past surface. The last chapter is gratuitous, appealing largely to the interest of those people in the locality who may care little for the more technical discussion. As a part of a general publication it is well worth while. The general treatment of the bulletin makes one feel that it has been written hurriedly and therefore does not reflect proper credit upon the writers, whose abilities in the art of clear presentation are well known. For this reason, the inclination is to accept the publication as a well-directed contribution and with the hopes that it will soon be replaced with somewhat more effective material. When the professional man offers the layman something practical, it is of the utmost importance for the sake of the professional world that no opportunity be afforded the layman to criticize the work as "impractical" or "academic."

EUGENE VAN CLEEF

GAGNIEUR, W. F. **Indian place names in the Upper Peninsula [of Michigan] and their interpretation.** *Michigan Hist. Mag.*, Vol. 2, 1918, No. 3, pp. 526-555. Lansing.

GREGG, W. R. **Free-air data at Drexel [Nebr.] Aerological Station: January, February, March, April, May, and June, 1917.** 101 pp.; diagrs., ill. **July, August, September, October, November, December, 1917.** 108 pp.; diagrs. *Monthly Weather Rev. Suppls. Nos. 10 and 11.* U. S. Dept. of Agriculture, Washington, D. C., 1918. [On this and the next publication see the note on p. 182 of this issue.]

GREGG, W. R. **Free-air data at Drexel, Nebr., and Ellendale, N. Dak., Aerological Stations: January, February, and March, 1918, inclusive.** With a description (pp. 12-13) of the Ellendale Aerological Station by V. E. Jakl. 82 pp.; diagrs., ills. *Monthly Weather Rev. Suppl. No. 12.* U. S. Dept. of Agriculture, Washington, D. C. 1918.

MOORE, R. C. **The environment of Camp Funston.** With a chapter on The Western Theater of War by D. W. Johnson. 81 pp.; maps, diagrs., ills. *State Geol. Survey of Kansas Bull. 4.* Topeka, 1918. [Camp Funston was established near Fort Riley, just below the junction of the Republican and Smoky Hill Rivers, which form the Kansas River. The bulletin is accompanied by an excellent map of the environs of the camp on the scale of 1:40,000; relief is shown in fine black contours supplemented by brown shading; woods are shown in green.]

POSEY, C. J. **The influence of geographic factors in the development of Minnesota.** *Minnesota Hist. Bull.*, Vol. 2, 1918, No. 7, pp. 443-453. St. Paul.

ROBINSON, DOANE, C. E. DELAND, AND O. G. LIBBY. **Additional Verendrye material.** Maps, ills. *Mississippi Valley Hist. Rev.*, Vol. 3, 1916, No. 3, pp. 368-399. Cedar Rapids, Iowa. [On the explorer of the northern Great Plains area, 1738-1742. See the note on "Eighteenth Century Explorations in the Middle-West: The routes of the Verendryes" in the *Review*, Vol. 6, 1918, pp. 283-284.]

SHIPPEE, L. B. **The first railroad between the Mississippi and Lake Superior.** *Mississippi Valley Hist. Rev.*, Vol. 5, 1918, No. 2, pp. 121-142. Cedar Rapids, Iowa.

WHITSON, A. R., W. J. GEIB, G. W. CONREY, AND A. E. TAYLOR. **Soil survey of Columbia County, Wisconsin.** iv. and 84 pp.; maps, ills. *Wisconsin Geol. and Nat. Hist. Survey Bull. No. 49: Soil Ser. No. 14.* Madison, 1916.

WHITSON, A. R., W. J. GEIB, T. J. DUNNEWALD, C. B. POST, W. C. BOARDMAN, A. R. ALBERT, A. E. TAYLOR, L. R. SCHOENMANN, AND CARL THOMPSON. **Reconnoissance soil survey of the north part of north central Wisconsin.** ii and 80 pp.; maps, ills. *Wisconsin Geol. and Nat. Hist. Survey Bull. No. 50: Soil Ser. No. 15.* Madison, 1916.

WHITSON, A. R., W. J. GEIB, O. J. NOER, AND A. H. MEYER. **Soil survey of Jefferson County, Wisconsin.** 78 pp.; maps, ills. *Wisconsin Geol. and Nat. Hist. Survey Bull. No. 48: Soil Ser. No. 13.* Madison, 1916.

WHITSON, A. R., W. J. GEIB, CARL THOMPSON, C. B. POST, A. L. BUSER, L. R. SCHOENMANN, AND A. E. TAYLOR. **Reconnoissance soil survey of north eastern Wisconsin.** iv and 87 pp.; maps, ills. *Wisconsin Geol. and Nat. Hist. Survey Bull. No. 47: Soil Ser. No. 12.* Madison, 1916.

WRIGHT, G. F. **Explanation of the abandoned beaches about the south end of Lake Michigan.** Maps, ill. *Bull. Geol. Soc. of Amer.*, Vol. 29, 1918, No. 2, pp. 235-244.

—— [*Topographic map of the United States.*] Sheets, 1:62,500: (1) ***Altenburg,*** (2) ***Dixon,*** (3) ***Good Hope,*** (4) ***La Harpe,*** (5) ***Morris,*** (6) ***Vermont, Ill.;*** (7) ***College Corner, Ind.-Ohio;*** (8) ***Cedar Springs,*** (9) ***Ionia,*** (10) ***Lowell, Mich.;*** (11) ***Felicity,*** (12) ***Fort Recovery,*** (13) ***Seaman, Ohio.*** U. S. Geological Survey, Washington, D. C., 1918.

—— ***North Dakota, State of.*** Compiled from official Records of the General Land Office and other sources under the direction of I. P. Berthrong. 1 in.:12 miles (1:760,320). General Land Office, Dept. of the Interior, Washington, D. C., 1918.

Western States

KEARNEY, T. H., L. J. BRIGGS, H. L. SHANTZ, J. W. MCLANE, AND R. L. PIEMEISEL. **Indicator significance of vegetation in Tooele Valley, Utah.** Map, diagrs., ills. Reprint from *Journ. of Agric. Research*, Vol. 1, 1914, No. 5, pp. 365-417. U. S. Dept. of Agriculture, Washington, D. C.

A paper of more than ordinary interest to plant geographers. One of its authors (Shantz) in an earlier paper described the correlation which exists between the vegetation types of the Great Plains and the physical characteristics of the soil; and from that he has drawn comparisons between the native growth and the suitability of the land for dry farming. The intensive study of Tooele Valley has carried this work much further. It is now possible to demonstrate (1) that a sagebrush (*Artemisia tridentata*) "association," when in good stand, indicates land that is well adapted to dry farming and irrigation; (2) that the Kochia (*Kochia vestita*) "association" denotes that dry farming is precarious owing to the small depth of soil free from alkali; (3) that the shadscale (*Atriplex confertifolia*) "association" indicates that dry farming is nearly as precarious as on Kochia land but that where water is available for irrigation the salts can probably be leached out of the soil; and (4) that the greasewood shadscale (*Sarcobatus vermiculatus* and *Atriplex confertifolia*) "association" grows on land which is not suitable for dry farming but which can be made to produce good crops

under irrigation. The relation between the root development and the conditions of soil moisture is shown in an accompanying diagram. The report contains a detailed map of the Tooele Valley on the south shore of Great Salt Lake.

TWITCHELL, R. E., edit. **Historical sketch of Governor William Carr Lane, together with diary of his journey from St. Louis, Mo., to Santa Fe, N. M., July 31st, to September 9th, 1852.** 62 pp.; ills. *Hist. Soc. of New Mexico* [*Publ.*] *No. 4*, [n. p.] 1917. 9 x 6.

Lane was appointed Governor of New Mexico by President Fillmore, and the journal records the incidents of his overland trip to the Territory of New Mexico, then only slightly known. He sets forth the potentialities of the territory in his first message to the Legislative Assembly (reproduced in the introduction), dwelling especially on the hydrography, while the annotator notes at length the controversy over the southern boundary, which arose from a question of national jurisdiction. Governor Lane's proclamation on the subject is included. The diary itself, comprising pages 23-62, is thoroughly elucidated by Mr. Twitchell, the notes shedding much light on the geography of the country through which passed the Santa Fe Trail. F. W. HODGE

FEWKES, J. W. **Types of prehistoric Southwestern architecture.** *Proc. Amer. Antiquarian Soc. at the Semi-Ann. Meeting Held in Boston Apr. 11, 1917*, Vol. 27 (N. S.), 1917, Part I, pp. 67-82.

FREEMAN, O. W. **Geographic influences affecting distribution of population and character of industries in Montana.** Reprinted from *Inter-Mountain Educator*, 1916, Jan. [7 pp.] [Abstracted in the *Review*, Vol. 1, 1916, p. 217.]

REED, W. G. **Rainfall data of Berkeley, California.** *Univ. of California Publs. in Engin.*, Vol. 1, 1915, No. 5, pp. 69-81. [Rainfall has been measured at Berkeley at least once a day since the establishment of the meteorological station at the University of California in 1887. More frequent observations have also been made from time to time, although the practice has varied. In view of the fact that the published rainfall data for the eastern San Francisco Bay region are rather scanty, Mr. William G. Reed has assembled the above data in this paper. The tables include the monthly and seasonal rainfall; number of days with 0.01 inch or more; greatest rainfall in 24 consecutive hours; and precipitation of marked intensity (see *Geogr. Rev.*, Vol. 2, 1916, pp. 385-386).—R. DEC. WARD.]

ROBBINS, W. W., J. P. HARRINGTON, AND BARBARA FREIRE-MARRECO. **Ethnobotany of the Tewa Indians.** xii and 124 pp.; map, ills., bibliogr., index. *Bur. of Amer. Ethnol. Bull. 55.* Smithsonian Institution, Washington, D. C., 1916. [Contains a section of geographic interest entitled "Cultivated Plants," which cites growing improvidence among the Tewa Indians near the railways; and also an archeological map of the Jemez Plateau and a good bibliography with several ethnogeographical entries.]

ROLFE, F. **Commercial geography of southern California.** 63 pp.; maps, diagrs., ills., index. [Biola Press, Los Angeles,] 1915. 8 x 5.

—— ***Lake Washington Ship Canal, Puget Sound to Lake Washington, Washington.*** 1:10,000. *U. S. Coast and Geodetic Survey Chart No. 6447.* Washington, D. C., Aug., 1918.

—— ***San Diego Bay, California.*** 1:20,000. *U. S. Coast and Geodetic Survey Chart No. 5107.* Washington, D. C., May, 1918.

—— [***Topographic map of the United States.***] Sheets: (1) ***Berenda,*** (2) ***Lingard,*** (3) ***Owens Creek,*** (4) ***Spring Valley, Cal.,*** 1:31,680; (5) ***Paradise Valley, Idaho,*** 1:62,500; (6) ***Heart Butte, Mont.,*** 1:125,000; (7) ***Stockton, Utah,*** 1:62,500. U. S. Geol. Survey, Washington, D. C., 1918.

EUROPE

SWITZERLAND, OR THE ALPS

SCHEFFEL, P. H. **Verkehrsgeschichte der Alpen.** Vol. 1: **Bis zum Ende des Ostgotenreiches Theodorichs des Grossen.** viii and 206 pp. 1908. 11s. 3d. Vol. 2: **Das Mittelalter.** viii and 297 pp. 1914. 16s. Dietrich Reimer (Ernst Vohsen), Berlin. 10½ x 8.

A history of trade and transportation in the Alps might well constitute a monumental monograph in the field of historical geography. The author of the present

volumes has hardly realized such a success, although here and there some carefully finished passage shows the attainment of a high level that is not sustained by the text in general. The deficiencies of the volumes are apparent, possibly more so than real. One looks in vain for a single picture, diagram, map—an illustration of any sort. Yet in the first volume Roman place names crowd the pages and in many cases are not located readily even by the classical student. References are furnished very sparingly. As yet no index is available, although one is promised. The title itself is somewhat misleading, as trade is a minor consideration in a large proportion of the chapters.

The set, nevertheless, is valuable to the student of Alpine affairs. The author is generously appreciative of geographic factors in history and has supplied in Volume 2 a good introductory chapter on "Natural Forces in the History of Alpine Regions." Three types of historical movements are taken up, namely the migrations and lesser shiftings of races, military expeditions, and commercial developments. Apparently one additional volume is planned. Most of the chapters are organized in historical sequence, a number, however, being concerned directly with highways of different periods. Thus, Chapter 6, Volume 1, deals with Roman roads, and the latter part of Volume 2 is an elaborate account of Alpine roads in the Middle Ages. The author has taken especial interest in the knotty problems of racial history in the Alps, most particularly in that of the Rhaeto-Romansh. Chapter 7, Volume 2, is a contribution of merit on racial conditions in medieval times. To the American reader the difficulties of research in European historical geography are made manifest, especially in two ways, first by the testimony of finds of antique coins on the beginnings, extent, and interruptions of Roman and pre-Roman colonization and trade, and secondly, by tracing through the origin of place names, family names, and even of traditions otherwise unrecorded racial movements.

CARL O. SAUER

ANFOSSI, G. **Il lago di Märjelen.** Map. *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 4-5, pp. 202-209. Florence. [Lake Märjelen is a small lake on the eastern side of the Aletsch Glacier in the Bernese Oberland.]

COOLIDGE, W. A. B. **Il Col d'Hérens (3480 m.) nella storia.** *Riv. Mensile Club Alpino Italiano*, Vol. 35, 1916, No. 7, pp. 185-197. Turin. [The Col d'Hérens is a glacier pass leading from the head of the Val d'Anniviers, a left tributary of the upper Rhone, to Zermatt at the foot of the Monte Rosa massif.]

FRESHFIELD, D. W. **The great passes of the Western and Central Alps.** Map, ills. *Geogr. Journ.*, Vol. 49, 1917, No. 1, pp. 2-26 (discussion, pp. 22-26). [Substantially the same paper was published in *Alpine Journ.*, No. 215, Vol. 31, 1917, pp. 158-189.]

HAUSER, HENRI. **La position géographique de la Suisse: Étude de géographie politique.** *Ann. de Géogr.*, No. 138, Vol. 25, 1916, pp. 413-428. [Abstracted in the *Review*, Vol. 3, 1917, p. 401.]

HORWITZ, M. L. **Sulla variabilità assoluta della temperatura annuale nella Svizzera.** *Boll. Bibliogr. No. 4*, 1916, pp. 7-8. Ufficio Idrografico, R. Magistrato alle Acque, Venice. [Abstract of an article published in *Archives des Sci. Physiques et Naturelles*, 1916, Aug. 15, Geneva.]

LORENZI, ARRIGO. **La funzione politica delle Alpi.** *Riv. Geogr. Italiana*, Vol. 23, 1916, No. 4-5, pp. 153-176. Florence.

LÜTSCHG, O. **Il lago di Märjelen.** *Boll. Bibliogr. No. 4*, 1916, pp. 25-26. Ufficio Idrografico, R. Magistrato alle Acque, Venice. [Review of a work published in 1916 in Geneva.]

ROCCATI, ALESSANDRO. **Il glacialismo nelle Alpi Marittime.** Ills. *Riv. Mensile Club Alpino Italiano*, Vol. 35, 1916, No. 2, pp. 41-47; No. 3, pp. 75-80. Turin.

RODRÍGUEZ, E. M. **Suiza: Noticia general geográfica y estudio especial de su geografía postal y de comunicaciones.** *Rev. de Geogr. Colon. y Mercantil*, Vol. 14, 1917, No. 1-2, pp. 10-40; No. 3, pp. 82-111. Real Soc. Geogr., Madrid.

ROEMER, ADOLF. **Klimatologisches über das St. Gallische Gebiet zwischen Walen- und Zürichsee.** Map. *Mitt. Ostschweizerischen Geogr. Commerc. Gesell. in St. Gallen*, 1915, No. 1-2, pp. 38-59. St. Gall.

SACCO, FEDERICO. **I ghiacciai antichi e attuali delle Alpi Marittime centrali.** Map. *Atti Soc. Italiana di Sci. Nat.*, Vol. 51, 1912, pp. 99-128. Pavia. [With map showing the great size of the Pleistocene glaciers compared with those known at present.]

TSCHUDI, IWAN VON. **Der Tourist in der Schweiz und Grenzgebieten.** Newly revised with preface by C. Täuber. Vol. 1: **Nordschweiz und Westschweiz.** xl and 193 pp.; maps, diagrs. Vol. II: **Urschweiz und Südschweiz.** Pp. vii and 195-370; maps, diagrs., ills. Art. Institut Orell Füssli, Zürich, 1916 and 1917. 6 x 4.

ITALY

ANDRIANI, GIUSEPPE. **Il Finale ligústico.** Map. *Boll. Reale Soc. Geogr. Italiana*, Vol. 5, 1916, No. 10, pp. 824-846. Rome. [Finale is a town on the Riviera di Ponente.]

ANFOSSI, GIOVANNI. **I laghi dell'Appennino settentrionale e la loro distribuzione.** Map, diagr., bibliogr. *Riv. Geogr. Italiana*, Vol. 22, 1915, No. 9-10, pp. 425-457. Florence.

ANFOSSI, GIOVANNI. **Le isole lacuali italiane.** Diagrs. *Boll. Reale Soc. Geogr. Italiana*, Vol. 6, 1917, No. 7-8, pp. 551-563. Rome.

ANFOSSI, GIOVANNI. **Premières recherches sur l'évaporation d'un lac de l'Apennin génois.** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 5, 1917, No. 1, pp. 115-127. Grenoble.

ANFOSSI, GIOVANNI. **Volumetria delle isole minori italiane (Studi orometrici, III).** Diagrs. *Memorie Geogr.* (Suppl. to *Riv. Geogr. Italiana*) *No. 31* (= Vol. 10, pp. 223-285). Florence, 1916. [The methods employed in a study of this kind, in which the volume of a land mass is determined, were outlined in a review of a similar work in the *Review*, Vol. 3, 1917, pp. 162-163.]

ARBOS, P. **Études sur l'habitat de montagne en Italie.** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 2, pp. 259-274. Grenoble.

AZZI, G. **Le problème de la météorologie agricole.** *Rev. Gén. des Sci.*, Vol. 29, 1918, May 30, pp. 307-311. [With special reference to the cultivation of wheat in Italy.]

BARATTA, MARIO, TORQUATO TARAMELLI, ALESSANDRO MARTELLI, GIOTTO DAINELLI, AND PAOLO VINASSA DE REGNY. **Pagine geografiche della nostra guerra: Raccolta delle conferenze tenute nell'anno 1916 alla Reale Società Geografica Italiana.** 179 pp.; maps, diagrs., ills. Rome, 1917. [Apropos of the territorial aspirations voiced by the Italian press this publication is of interest. It is a collection of papers read before the Society during the year 1916 and deals with the geographical aspects of the Italo-Austrian frontier region. It reflects the Italian viewpoint, emphasizing the geographical basis for Italy's coveted control of the Adriatic.]

BÉNÉVENT, E. **La plaine du Pô: Étude de géographie humaine d'après le livre de M. Arrigo Lorenzi.** *Recueil des Trav. de l'Inst. de Géogr. Alpine*, Vol. 4, 1916, No. 2, pp. 189-236. Grenoble. [Abstracted in the *Review*, Vol. 5, 1918, pp. 147-148.]

BIANCHI, ADELE. **La Cioceria: Monografia corografica.** Ills., bibliogr. *La Geografia*, Vol. 4, 1916, No. 2-3, pp. 85-99; No. 4-7, pp. 230-255. Novara. [The valley of the Sacco between the Ernici and Lepini ranges in Latium.]

BOUCHER, E. S. **Sardinia in ancient times.** 185 pp.; map, bibliogr., index. B. H. Blackwell, Oxford, 1917. 8 x 5.

BRIAN, ALESSANDRO. **Carte geografiche del Genovesato e dell'Isola di Corsica del secolo XVIII (contributo per la storia della cartografia Ligure e Corsa).** Maps, bibliogr. *Atti Soc. Ligustica di Sci. Nat. e Geogr.*, Vol. 26, 1915, No. 2, pp. 39-56. Genoa.

CABRINI, ANGIOLO. **Emigrazione ed emigranti.** *Riv. Coloniale*, Vol. 11, 1916, No. 9, pp. 458-471; No. 10, pp. 595-608; No. 11, pp. 662-669. Rome. [Italian emigration.]

CANAVARI, IGINO. **La carta geo-agronomica di Casalina (Perugia).** 38 pp.; map. Reprint from *Atti Soc. Toscana di Sci. Nat.*, Vol. 29. Pisa, 1913.

CHECCHIA-RISPOLI, G. **I terrazzi delle pendici meridionali del Gargáno.** Map. *La Geografia*, Vol. 4, 1916, No. 4-7, pp. 255-259. Novara. [Monte Gargáno occupies the "spur" of Italy's boot.]

COLAMONICO, CARMELO. **La distribuzione della popolazione nella Puglia centrale e meridionale secondo la natura geologica del suolo.** Maps, diagrs. *Boll. Reale Soc. Geogr. Italiana*, Vol. 5, 1916, No. 3, pp. 201-234; No. 4, pp. 274-305; No. 5, pp. 403-429. Rome.

COLAMONICO, CARMELO. **La piovosità della terra d'Otranto.** Maps, diagrs. *Boll. Reale Soc. Geogr. Italiana*, Vol. 6, 1917, No. 7-8, pp. 509-537. Rome.

COLAMONICO, CARMELO. **Zone di piovosità e densità di popolazione nella provincia di Lecce.** Maps. *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 5, pp. 161-180. Florence.

CORTI, ALFREDO, AND WALTHER LAENG. **Le Alpi di Val Grosina.** ix and 106 pp.; map, ills., index. (Gruppo Lombardo Alpinisti senza Guide.) Stabilimento Tipografico "Luzzago," Brescia, 1909. L. 3. 6 x 4.

COSSU, ANGELO. **L'isola di Sardegna: Saggio monografico di geografia fisica e di antropogeografia.** 222 pp.; diagr., ills., bibliogr. Società Editrice Dante Alighieri de Albrighi, Segati & C., Milan, etc., 1916. L. 2.50. 8½ x 5½.

RICCHIERI, GIUSEPPE. **L'insegnamento della geografia nella progettata revisione dei programmi delle scuole medie.** *Boll. Reale Soc. Geogr. Italiana*, Vol. 7, 1918, No. 7-8, pp. 553-571. Rome.

SBROCCA, A. **Variazioni nella circoscrizione territoriale dei comuni.** Map. *Boll. Reale Soc. Geogr. Italiana*, Vol. 7, 1918, No. 7-8, pp. 586-596. Rome.

AFRICA

SAHARA, INCLUDING EGYPT

HURST, H. E. **The magnetic survey of Egypt and the Sudan.** 53 pp.; maps. *Survey Dept. [of Egypt] Paper No. 33.* Ministry of Finance, Cairo, 1915.

LOFT, GENIVERA. **The caravan trade of the Sahara.** Map, bibliogr. *Journ. of Geogr.*, Vol. 15, 1916-17, No. 7, pp. 221-226. [An informing compilation of facts about caravan routes in the Sahara, their location, the nature of the caravans that traverse them, perils of the route, caravan leaders, nature of the commerce, and its general decline.]

MASI, CORRADO. **Alle frontiere della Libia.** xxxii and 191 pp.; ills. F.lli Lambruschini, Empoli, 1915. 10 x 7.

OLUFSEN, OLE. **Muhammedanske Grave og Gravminder i Sahara og Tunisien.** Diagrs., ills. *Geografisk Tidskrift*, Vol. 23, 1916, No. 6, pp. 205-224; No. 7, pp. 247-257. Copenhagen.

ROLFE, DEETTE. **Geographic influences in the political development of ancient Egypt.** *Bull. Geogr. Soc. of Philadelphia*, Vol. 14, 1916, No. 4, pp. 169-174.

SCHIAPARELLI, ERNESTO. **La geografia dell'Africa orientale secondo le indicazioni dei monumenti egiziani.** viii and 307 pp.; ills. R. Accademia dei Lincei, Rome, 1916. 12 x 9.

ASIA

GENERAL

HERBERTSON, A. J., AND O. J. R. HOWARTH, edits. **The Oxford survey of the British Empire. Vol. 2: Asia, including the Indian Empire and dependencies, Ceylon, British Malaya and Far Eastern possessions.** x and 505 pp.; maps, ills., index. Clarendon Press, Oxford, 1914. 14s. 9 x 6.

This volume is one of a series of six covering the respective parts of the British Empire, of which the others have already been noticed (America, *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, pp. 971-972; Africa, *Geogr. Rev.*, Vol. 1, 1916, p. 70; Australasia, *ibid.*, Vol. 6, 1918, p. 380; The British Isles and Mediterranean possessions, and General Survey, *ibid.*, Vol. 7, 1919, pp. 61-62). The reviewer has found the volume of much value for reference. The twelve authors are men of high ability whose names carry weight. The book is intended to be a "survey . . . of the geographical and allied aspects" of the British possessions in Asia "together with their economic, administrative, and social conditions at the present time." This intention is well carried out in the chapters dealing with smaller possessions, but not so well in the case of India. For instance, Professor Gardiner gives an admirable picture of the Maldive and Laccadive Islands. To be sure, his chapter is stronger in its discussion of coral reefs than in its account of the people, but this does no harm, for other chapters emphasize other phases. Thus in the chapter on Ceylon Dr. Willis gives a strong botanical flavor, to which is joined a good deal of archeology, while in the Malay chapter Mr. Graham is particularly strong in his insight into the character of the people. He feels that the art for which they

are sometimes praised was never great and is now declining. They seem to be an inefficient people, best adapted to easy work, such as copra raising. The chapter on Borneo is especially interesting because of its emphasis on the way in which a high-minded man like Rajah Brooke can improve the condition of the natives. It will surprise many to learn that the famous Rajah has purposely retarded the construction of roads and railroads. They bring in outsiders such as the Chinese or Europeans, and thus the poor, incompetent natives are at a disadvantage and gradually go to the wall, as the Malays are fast doing in the Malay Peninsula.

In spite of 300 pages devoted to India the reader receives a much less vivid impression of that country than of the smaller British possessions. Yet many chapters are admirable. For instance, in discussing the vegetation, forestry, and fauna Mr. Eardly-Wilmot is peculiarly happy in pointing out the importance of the forests, which cover 20 per cent of the area and furnish reserve pasturage for the cattle in times of drought. Other chapters, such as those on "Agriculture," "Industrial and Economic Conditions," "Languages, Customs, and Religions," and "Political Government and Administration," are crammed with valuable facts but are so encyclopedic that they are not adapted to general reading.

The most disappointing feature of the book is that it gives little insight into the life of the Indian people. The section on customs, for example, is devoted entirely to a long series of short statements as to customs in respect to marriage and death. Certain other important matters are also treated inadequately. For example, the chapter on agriculture contains the statement that "the Indian budget is a gamble against rain," but nowhere does the book contain more than incidental references to the famines, which are perhaps the most important feature in the economic life of India.

The concluding chapter on India—"Western Influence" by Mr. R. C. Temple—is a masterly treatment of the problem created by the meeting of a fully developed Oriental system and a fully developed Western system. "Caste may be good as a moral restraint, particularly in its reference to women, but it is very bad for political unity, for no two castes work together." This fact has made it easy for the British to rule. The power of caste, however, is being broken. Educated natives are examining the pedigrees of many of the high castes and finding that there is no such purity of blood as has been claimed. Railways, as everyone knows, are deadly enemies of caste because people of all kinds must crowd together. Christian missions and good government are giving the lower castes a new spirit of self-respect. Hence Indian society is being subjected to a great upheaval from beneath. From above there is also a spirit of unrest because of the growth of an educated middle class—a thing never before existing in India.

The attitude of the various classes toward Britain is peculiarly interesting at the present juncture. The educated middle class is sharply split into satisfied, pro-British office holders, and dissatisfied non-office-holders. The lower castes are pro-British. So too are the native princes, for their own position depends on the maintenance of the British Empire. Other small, but powerful groups like the Parsis and Armenians are likewise pro-British, and do much to maintain the Empire. The interplay of such varied forces makes India well-nigh the most interesting country in the world. Therefore a volume such as this is welcome and is sure to be frequently referred to.

ELLSWORTH HUNTINGTON

RECLUS, ONÉSIME, edit. **Grande Géographie Bong illustrée: Les pays et les peuples: Vol. 3 [Scandinavia, and Asia].** 448 pp.; maps, diagrs., ills. CHARLES RABOT: **La Scandinavie (Norvège, Suède, Danemark, Islande)**, pp. 3-68; PAUL LABBÉ: **Sibérie**, pp. 71-110; D. AÏTOFF: **Asie occidentale turque et arabe**, pp. 113-160; D. AÏTOFF: **Asie intérieure**, pp. 163-192; JULES HARMAND: **Perse**, pp. 195-212; HENRI CORDIER: **Chine**, pp. 215-274; PAUL LABBÉ: **La Mantchourie**, pp. 275-280; JULES HARMAND: **Empire indo-britannique**, pp. 283-348; H. DE LAMOTHE: **Péninsule indochinoise**, pp. 351-380; HENRI FROIDEVAUX: **Japon**, pp. 383-412; JULES HARMAND: **Inde néerlandaise**, pp. 415-438. Bong & Cie., Paris, 1913. 15 x 12.

The sketches of Asiatic geography assembled in this volume form well-balanced descriptions of a particularly interesting continent. The authors provide attractive passages on the whole of the great region from Siberia to Ceylon and from Arabia to Japan and the Dutch Indies. Basing their work primarily on relief, they show that natural features have determined the trend of routes and the distribution of populations; but it is mainly the writers' simplicity and their ability to maintain presentation at an agreeable level that give value to their pages.

The spirit of Reclus and his ideals live in this work even though the exhaustiveness which characterized the eminent geographer's masterpiece is far from having been

attained. The Grande Géographie Bong, however, has the greater advantage of affording up-to-date information. Many historical notes, incorporated in the text, are welcome to the historian inclined to fall back upon geography to explain fundamental relations in his own field.

In many places the descriptions might well have been lengthened; yet the reader is given all that he would naturally look for in a general work of this character. The only omission that is really felt is a chapter devoted to Asia as a whole, in which a comprehensive survey might have been presented by way of introduction. Such a chapter might have taken the space reserved for Scandinavia. As it is, the inclusion of northern Europe in a volume otherwise solely devoted to Asia appears awkward.

The reader is therefore trusted to supply the generalization needed in the broad outlook which takes in the world's largest continent. There is zest in this search, and with a little diligence some interesting relations may be worked out. For one thing the intimate connection between eastern and western Asia is brought out. This is necessary for a better understanding of the continent, its men and ideals. Furthermore, vital problems growing out of the war will have to be settled in both eastern and western Asia. For a preliminary acquaintance with these problems as well as with the regions affected, the inquisitively minded reader may resort to this volume with profit.

The mechanical make-up of this work is of exceptional excellence. Splendidly colored illustrations showing localities of scenic or historical fame have been reproduced in full-page size. Included among them is an occasional reproduction of masterpieces by native artists. The maps are clear and of atlas quality, many being colored. Three other volumes in the series have already been reviewed (Vol. 4, Africa, *Geogr. Rev.*, Vol. 4, 1917, p. 327; Vols. 1 and 2, Europe, *Geogr. Rev.*, Vol. 6, 1918, p. 378).

CITATI, PIETRO. **La via maestra alle Indie e le sue succursali.** *Riv. Militare Italiana*, Vol. 40, 1915, No. 10, pp. 1943-1965. Rome. [Sea route to India.]

COOPER, C. S. **The modernizing of the Orient.** 353 pp.; ills., index. McBride, Nast & Co., New York, 1914. $2.00. 8½ x 5½.

DAVIES, A. M. **The problem of the Himalaya and the Gangetic trough.** *Geogr. Journ.*, Vol. 51, 1918, No. 3, pp. 175-183. [Review of recent literature on the structure of the Himalayas and the Gangetic Plain as elucidated by deviations of the plumb line.]

DINGELSTEDT, V. **Tatar tribes.** *Scottish Geogr. Mag.*, Vol. 33, 1917, No. 5, pp. 209-226.

ECKARDT, W. R. **Über Luftdruckverteilung und Regenfall in Asien, mit besonderer Berücksichtigung der Randgebiete.** Maps. *Annal. der Hydrogr. und Marit. Meteorol.*, Vol. 44, 1916, No. 11, pp. 542-554. Hamburg.

H[INKS], A. R. **The identification of peaks in the Himalaya.** With note by Colonel Sir Sidney Burrard. *Geogr. Journ.*, Vol. 52, 1918, No. 3, pp. 184-193.

KELLAS, A. M. **A consideration of the possibility of ascending the loftier Himalaya.** Diagrs., ills. *Geogr. Journ.*, Vol. 49, 1917, No. 1, pp. 26-48 (discussion, pp. 46-48). [Considers especially physiological difficulties of high altitudes.]

MACHATSCHEK, FRITZ. **Japan, China, und Russland.** *Österreichische Monatsschr. für den Orient*, Vol. 41, 1915, No. 9-12, pp. 284-286. Vienna.

OKADA, T. **Some researches in the Far Eastern seasonal correlations.** Diagrs. *Monthly Weather Rev.*, Vol. 45, 1917, No. 5, pp. 238-240. [This is a continuation of the paper that appeared in the *Monthly Weather Rev.*, Jan., 1916 (pp. 17-21), and was noted in the *Geogr. Rev.*, Vol. 2, 1916, p. 166.]

RIVETTA, P. S. **Verso un nuovo equilibrio dell'Asia: Causa e importanza del trattato russo-giapponese nell'estremo e prossimo Oriente.** Map. *Riv. Coloniale*, Vol. 11, 1916, No. 10, pp. 569-579; No. 11, pp. 641-653. Rome.

SCHOFF, W. H. **The transcontinental silk trade at the Christian era.** Map, ills. Reprint from *Proc. Numismatic and Antiquarian Soc. of Philadelphia*, Vol. 27, [1915], pp. 47-64. [By "at the Christian era" is meant at the beginning of the Christian era, or roughly from 100 B. C. to 100 A. D.]

TAI, TSE TSAN. **The creation. The real situation of Eden and the origin of the Chinese.** ix and 45 pp.; maps, ill. Kelly & Walsh, Ltd., Hongkong, 1914. $2.00. 9 x 5½. [The author places the "Garden of Eden," i.e. the cradle of the human race, in Chinese Turkestan.]

India

GAIT, E. A. **Census of India, 1911. Vol. 1: Part I: Report.** xi, 450, and xviii pp.; maps, diagrs., index. **Vol. 2: Part II: Tables.** 439 pp. Superintendent of Government Printing, Calcutta, 1913. Vol. 1, 7s. 6d.; Vol. 2, 6s. 13½ x 8½ each.

The Census of India is interesting because it counts the huge number of 315,000,000 people; because it was made in the one moonlight night of March 10, 1911, by a force of 2,000,000 enumerators and superintendents, mostly natives of India; because it cost less than $700,000; and because the totals were completely reported in nine days—indeed, the two native states Rampur and Sarangarh had complete reports for all parts of the two states ready to telegraph the totals to Calcutta at 8 o'clock on the morning of March 11. The general method was to prepare the schedules for everyone at his customary place of residence several weeks in advance and merely revise the schedules on the appointed date. Some of the most striking errors were made by Europeans, who were allowed to enumerate themselves.

As a great majority of the people of India depend on agriculture for a living, the climate is of great importance and is described in the report with some detail, the monsoons being regarded as the main control for almost all of India. An annual rainfall of 70 inches is needed to ensure crops, and rainfall is a most important factor in the whole distribution of population. The country is divided into sixteen natural divisions, based on rainfall, and these are described at some length. It is not true that population density in India is proportional to the amount of rainfall, but among the natural divisions with less than 40 inches of rain there is "a general correspondence between the rainfall and the density of population." Irrigated areas have a population out of all proportion to their rainfall. Of irrigated lands India has now 35,000 square miles. But even irrigation is quite secondary to surface. The most important of all controls of population density is levelness of surface. Level land may all be cultivated and does not waste by erosion. Hilly land drains dry too readily and washes badly. Terracing must be resorted to; but that demands a deep soil, is costly, and is after all a poor substitute for level land. Even soil is less important in India than surface configuration.

Urban life in India is lived in places of more than 5,000 people, which are hardly more than large villages, without the schools, institutions, trade, and industry that characterize the towns. On this basis less than 10 per cent of the population is urban as compared with 78 in England and Wales and 46 in Germany. The range is from 18 per cent in Bombay, the region of cotton mills, to 3 per cent in Assam, the land of wild peoples. A peculiarity of the larger towns is their small proportion of females, most extreme in Calcutta, where they are but a third as numerous as males. Immigration of male factory workers to the large cities, unaccompanied by their families, has swelled their population. Of cities of 100,000 India has but 30, to 44 in the United Kingdom and 50 in the United States. City life is not well developed in this land; nevertheless there are 28,000,000 people living in cities, two of which have over 1,000,000 each.

One consequence of so general a dependence on agriculture is the liability to famine when the rain fails. But relief programmes are carefully organized and kept up to date so as to be put in operation at a moment's notice.

MARK JEFFERSON

PHYSICAL GEOGRAPHY

Meteorology

—— **Meteorology, Introductory. Prepared and issued under the auspices of the Division of Geology and Geography, National Research Council.** xii and 150 pp.; maps, diagrs., illa., bibliogr. Yale University Press, New Haven, 1918. $1.00. 9 x 6.

The Committee on Education and Special Training of the War Department wisely included meteorology among the subjects to be studied in the Students' Army Training Corps. To meet the needs of both teachers and students this volume was prepared, under the auspices of the National Research Council, as an emergency text. The specific object for which the book was planned ceased to exist almost immediately after the volume came from the press. There has, however, for some years been increasing need of a textbook of meteorology for general use in college courses, which is up to date, not too advanced in character, and purchasable for a moderate price. Whether the volume now before us fills, or can be so modified as to fill, that manifest need has been the question in the mind of the reviewer and will probably also be the question which will interest many of those who know that the new text is now available.

In the great need of haste in the preparation of this book it was natural and proper that the National Research Council should have entrusted the work to the Weather Bureau in Washington, among several of whose staff the various topics were distributed. The major part of the book was prepared by Professor W. J. Humphreys and is to a considerable extent taken from that writer's papers on the physics of the air recently published in the *Journal of the Franklin Institute*. Other sections were contributed by A. J. Henry, J. Warren Smith, S. P. Fergusson, C. F. Talman, and W. R. Gregg. It is distinctly to the credit of the Weather Bureau that the volume was prepared so promptly.

Characterizing the book as a whole, it may be described as a series of very compact, independent, and rather loosely connected chapters dealing with various meteorological subjects, with marked emphasis on the more distinctly physical aspects of the science, and strikingly lacking the human element. The successive sections deal with the atmosphere; measurement of the meteorological elements; atmospheric temperatures (vertical and horizontal distribution); atmospheric pressure; evaporation and condensation; fogs and clouds; general and secondary circulation of the atmosphere; forecasting, and climate. A short bibliography is also included. Recognizing the extraordinary haste in the preparation of the volume and the necessary difficulties attending its publication in the war emergency, it would naturally be unfitting in the reviewer to venture upon any extended or critical discussion of the book. Noting, however (p. vi), that "criticism is invited to the end that a second edition may show improvement and better adaptation to its purpose," he is encouraged to make a few suggestions.

What the book most needs is a general revision which may better adapt it for use in teaching. This would involve a closer co-ordination of the separate chapters; a fuller, but yet a clear and simple explanation of some of the more difficult subjects, such, for example, as the effects of the earth's rotation; the omission of sections which seem unnecessary in an introductory meteorology, as, for instance, that on atmospheric optics (except for very brief mention), and some of the detailed discussion of vertical temperature gradients and of certain of the less commonly used instruments; a more systematic arrangement of such matters as winds, where a good working classification, such as that suggested by Professor W. M. Davis, helps immensely in teaching; and the addition of a chapter on rainfall, which is now wholly lacking. Considerable revision of the more complex portions of the sections on evaporation and condensation and on the general circulation of the atmosphere would make those subjects more intelligible to the average reader and would therefore further the use of the volume as a textbook. One additional element which is of the greatest importance in making the subject interesting and popular is the need of frequent emphasis on its varied human relations. Few sciences touch man more closely, or at so many different points. If a study of meteorology is to become what it should become, general, popular, and practical, then those who teach it should let no opportunity pass to emphasize the many and varied relations which exist between atmospheric phenomena and the life of man. At present the volume before us lacks, almost completely, this vital interest. Indeed, there is in it only one direct reference to this essentially human and therefore popular aspect of meteorology, that (p. 93) which notes the effect of a mirage on a certain military engagement in Mesopotamia during the war.

To sum up: In its present form, the volume does not seem to be adapted for use as a textbook, although most of it could, without much difficulty, and without greatly increasing the size and cost of the volume, be revised in such a way as to make a second edition a valuable and much-needed book for use in the classroom. If this revision can be carried out, with the viewpoint of the teacher and student in mind, the volume will become a useful addition to the available meteorological textbooks. There are extraordinarily few slips. We note *bogs* for fogs (p. 88); *knwon* for known (p. 93), and that Fig. 6 is upside down. R. DEC. WARD

ABBOT, C. G. **On periodicity in solar variation.** 8 pp. Diagrs. *Smithsonian Misc. Colls.*, Vol. 69, No. 6. Washington, D. C., 1918.

CHAPMAN, S. **An outline of a theory of magnetic storms.** Diagrs. *Proc. Royal Soc.*, No. A 666, Ser. A, Vol. 95, 1918, pp. 61-83. London.

MCADIE, ALEXANDER. **Uniformity in aerographic records: The desirability of universal scientific units.** *Scientific American Suppl.*, No. 2244, Vol. 87, 1919, Jan. 4, pp. 15-16.

PAINE, G. P. **Report on modes of air motion and the equations of the general circulation of the earth's atmosphere.** Diagrs., bibliogr. *Monthly Weather Rev.*, Vol. 46, 1918, No. 7, pp. 311-323. Washington, D. C.

SHAW, NAPIER. **The travel of circular depressions and tornadoes and the relation of pressure to wind for circular isobars.** 26 pp.; maps, diagrs. *Geophysical Memoirs No. 12.* Meteorological Office, London, 1918.

SIMPSON, G. C. **The twelve-hourly barometer oscillation.** Maps, diagrs. *Quart. Journ. Royal Meteorol. Soc.*, No. 185, Vol. 44, 1918, pp. 1-19 (discussion, pp. 18-19). London. [Followed by "A Note on the Propagation of the Semi-Diurnal Pressure Wave" by F. J. W. Whipple, pp. 20-22.]

WARD, R. DEC. **Climate—Considered especially in relation to man.** 2nd edit., revised. xv and 380 pp.; maps, diagrs., bibliogr., index. (Science Series, No. 20.) G. P. Putnam's Sons, New York and London, 1918. $2.00. 8½ x 5½. [In the present new edition of this standard work the chapters on "The Characteristics of the Polar Zones" and on "Change of Climate" have been revised, the former mainly according to Meinardus for the Antarctic, and the latter to take into account Huntington's recent work. Although involving the making of new cuts it might have been advisable to show the Northeast Foreland of Greenland and Nicholas II Land on the three polar charts, Figs. 30, 31, and 32, in order to bring them up to date in their representation of the distribution of land and water. The first edition, 1908, was reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 40, 1908, p. 490.]

HUMAN GEOGRAPHY

ECONOMIC GEOGRAPHY

Production

CROOKES, WILLIAM. **The wheat problem.** 3rd edit., with . . . . a chapter on future wheat supplies by R. Henry Rew, and introduction by Lord Rhondda. xvi and 100 pp.; diagrs. Longmans, Green & Co., London, 1917. $1.25. 8 x 5.

In 1898 Sir William Crookes, delivering his presidential address before the British Association for the Advancement of Science, stated the wheat problem thus: "What can the United Kingdom do to be reasonably safe from starvation in presence of two successive failures of the world's wheat harvest, or against a hostile combination of European nations?" Sir William's own contribution towards solution was that "starvation may be averted through the laboratory" and he proceeded to discuss the problem of fixation of atmospheric nitrogen. The pertinence of the entire discussion to the present food situation in Britain led the late food controller, Lord Rhondda, to republish the address in revised form. To the original statement has been added a chapter on recent developments. As Lord Rhondda points out in his introduction, the wheat problem may be solved in two ways—by increasing the acreage or by increasing the yield per acre. Decline of the wheat acreage in Britain and possibilities of extending it are briefly discussed (a full statement of the various factors entering into the problem is given in Hall: Agriculture After the War, New York, 1916). The question of oversea producing areas is looked into without particularly encouraging conclusions as regards the extension of production: "the extension of the wheat-growing area is nearing its limits." In this, however, Sir William is at variance with other authorities. As Lyde points out in an interesting review, "The Real Wheat Question" (*Geogr. Journ.*, Vol. 51, 1918, pp. 325-329), the climatic limits of wheat growing in Canada have not been reached. Canada is the nearest British source of supply, and by this geographer the *real* wheat problem, of the immediate present at least, is regarded as how to insure the Canadian supplies reaching the mother country.

A more optimistic view, however, is expressed in the concluding chapter, "Future Wheat Supplies," by Sir Henry Rew, who considers that the main point in which war conditions throw light on the future problem is "evidence of rapid response of wheat acreage to economic pressure." Furthermore, statistics show that during the decade 1901-11 the acreage of wheat has increased more rapidly than population; and of special interest to Britain is the ratio in the Empire, where the increase in acreage amounted to 45.5 per cent with a population increase of 6.6 per cent.

Sir William's chief contribution in the present as in the earlier editions is that of the chemist. He describes the various processes by which, since the date of his address, atmospheric nitrogen has been fixed on a commercial scale, and gives an interesting table of the imports and exports of synthetic nitrogenous fertilizers from 1913 to 1915.

ARNOLD, RALPH. **General conditions of the petroleum industry and the world's future supply.** *Bull. Geol. Soc. of Amer.*, Vol. 28, 1917, No. 3, pp. 603-616. [The writer believes that the maximum point of the world's petroleum production (disregarding Africa, an unknown but probably not important factor) will be reached within the

next ten years. The United States, Italy, Galicia, and Germany have attained their maxima. Canada and Russia showed maxima some years ago, but it is probable that new fields will be opened in both countries. In other oil-producing regions production is on the increase.]

DAVIS, A. P. **Irrigation works constructed by the United States government.** xvi and 413 pp.; diagrs., ills., index. John Wiley & Sons, Inc., New York, Chapman & Hall, Ltd., London, 1917. $4.50. 9 x 6. [Engineering descriptions.]

FEARNSIDES, W. G. **The shortage of the supply of non-phosphoric iron ore.** Maps, diagrs. *Journ. Royal Soc. of Arts*, No. 3384, Vol. 65, 1917, pp. 743-754; No. 3385, pp. 757-766; No. 3386, pp. 771-783. London. [Abstracted in the *Review*, Vol. 5, 1918, pp. 74-75.]

—— **Proceedings of the Third International Congress of Tropical Agriculture Held at the Imperial Institute, London, June 23rd to 30th, 1914.** xi and 407 pp. Internat. Assoc. for Tropical Agric., and John Bale, Sons & Danielsson, Ltd., London, 1914. 10s. 19½ x 6. [Containing abstracts of papers and reports of discussions. The papers read are contained in full in two volumes of "Transactions," published later.]

—— **Rice, Production and uses of.** *Bull. Imperial Inst.*, Vol. 15, 1917, No. 2, pp. 198-267. London. [Deals exhaustively with production in British Empire and also gives an excellent summary of production in other countries.]

ROORBACH, G. B. **The world's food supply.** 33 pp.; diagrs. Reprint from *Annals Amer. Acad. of Polit. and Soc. Sci. (Publ. No. 1148)*, 1917, Nov. Philadelphia.

SALLIOR, P. **Gisements de potasse nouveaux.** Diagrs. *La Nature*, No. 2304, 1917, Nov. 24, pp. 324-326. [Cf. note in the *Review*, Vol. 5, 1918, p. 149.]

WILCOX, E. V. **Tropical agriculture: The climate, soils, cultural methods, crops, live stock, commercial importance, and opportunities of the tropics.** xviii and 372 pp.; ills., bibliogr., index. D. Appleton & Co., New York and London, 1916. $2.50. 8 x 5½.

HISTORY OF GEOGRAPHY AND EXPLORATION

AVERDUNK, H., AND J. MÜLLER-REINHARD. **Gerhard Mercator und die Geographen unter seinen Nachkommen.** viii and 188 pp.; map, diagrs., ills., index. *Ergänzungsheft No. 182 zu Petermanns Mitt.* Justus Perthes, Gotha, 1914. M.14. 10½ x 7½.

This biography, in the main, is the work of the first-named author, the second apparently contributing but two or three chapters relating chiefly to Mercator's globe studies and to his studies in the fields of magnetism and map projection. The *raison d'être* for the publication is stated to be a desire to furnish in the German language a biography of the distinguished geographer for whom, with Breusing, a German nationality is claimed, contrary to the opinion of van Raemdonck, who considered him to be of Flemish origin.

It may be said that the authors have prepared an exceedingly interesting, and for the general purposes of students and readers, an adequate account of the life and work of Mercator. Such information of value as the years have furnished concerning him, since the issue of the van Raemdonck and the Breusing publications, has been duly inserted, notably a reference to the influence now known to have been exerted upon Mercator's early years by Gemma Frisius, whose recently discovered globes give the interesting evidence.

Chapters have been included giving detailed notice of the Gemma globes and also of the globes of Mercator, which exerted an influence very pronounced in globe construction for a period of more than one hundred years.

To each of the distinguished geographer's individual large maps, including his world map of the year 1538—and the authors here perpetuate the now inexcusable error that but one original copy of this is known—his map of the British Isles and of Europe, as well as his all-important world map of the year 1569, consideration is given, though a detailed critical study of neither has been undertaken.

Mercator's letters, so valuable as intimate sources for an understanding of the character of the man, and published by van Raemdonck and van Ortroy, are not reprinted in full in this work; but a running comment on each is presented showing the particular

importance attaching to it. The concluding chapters give an account of Mercator's sons and successors who carried on the work he had initiated. Illustrations, to the number of 28 full-page plates (including portraits, title pages, and maps), have been inserted.
E. L. STEVENSON

GALLOIS, L. **Paul Vidal de la Blache.** Ill. *Ann. de Géogr.*, No. 147, Vol. 27, 1918, May 15, pp. 161-173. [An admirable account of the life and work of the late dean of French geographers.]

ISNARD, ALBERT. **Joseph-Nicolas Delisle: Sa biographie et sa collection de cartes géographiques à la Bibliothèque Nationale.** *Bull. Section de Géogr. du Comité des Travaux Hist. et Sci.*, Vol. 30, 1915, pp. 34-168. Paris, 1916.

KELTIE, J. S. **A half-century of geographical progress.** Maps. *Scottish Geogr. Mag.*, Vol. 31, 1915, No. 12, pp. 617-636. [Abstracted in the *Review*, Vol. 2, 1916, pp. 306-307.]

KELTIE, J. S. **Thirty years' work of the Royal Geographical Society.** *Geogr. Journ.*, Vol. 49, 1917, No. 5, pp. 350-376 (discussion, pp. 373-376).

LULOFS, H. J. **Geographie in den spiegel der oudheid (Polybius, Strabo, Cl. Ptolemaeus, Eustathius).** Bibliogr. *Tijdschr. Kon. Nederl. Aardrijk. Genoot.*, Vol. 34, 1917, No. 6, pp. 822-852; Vol. 35, 1918, No. 1, pp. 20-52.

MARGERIE, EMMANUEL DE. **La géologie.** Ill., bibliogr. *La Science Française*, Vol. 1, pp. 201-264. (Exposition universelle et internationale de San Francisco.) Librairie Larousse, Paris, 1915. 9 x 6. [An account of France's contribution to geological science.]

—— **Margerie, Emmanuel de, Notice sur les travaux scientifiques (géographie et géologie) publiés par, de 1882 a 1917.** 68 pp. Gauthier-Villars et Cie., Paris, 1917. 11 x 9.

MARINELLI, OLINTO. **Lo stretto di Anian e Giacomo Gastaldi.** Map. *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 1-2, pp. 39-49. Florence.

MERINO, ABELARDO. **Estudios histórico-críticos sobre Magellanes.** Ill. *Bol. Real Soc. Geogr.*, Vol. 59, 1917, No. 4, pp. 500-536. Madrid.

RICCHIERI, GIUSEPPE. **La geografia al Congresso della Società Italiana per il Progresso delle Scienze (Milano-Torino 2-7 Aprile).** *Riv. Geogr. Italiana*, Vol. 24, 1917, No. 5, pp. 181-186. Florence.

SMITH, G. E. **Ancient mariners.** Map, illus. *Rept. and Proc. Belfast Nat. Hist. and Philos. Soc., Session 1916-17*, pp. 44-72. Belfast, 1918. [Early maritime intercourse and the part it has played in the diffusion of civilization. See also *Journ. Manchester Geogr. Soc.*, Vol. 33, 1917, Parts I-IV, pp. 1-22.]

T[HOMSON], J. A. **Alexander McKay.** Ill. *Trans. and Proc. New Zealand Inst.*, Vol. 50, 1918, pp. vii-viii. Wellington. [This volume contains a short biographical sketch of Alexander McKay, late Government Geologist of New Zealand, whose geological explorations covered almost the entire area of New Zealand and whose writings form the only source of information regarding many parts of the islands.]

VIGNAUD, HENRY. **Americ Vespuce, 1451-1512: Sa biographie, sa vie, ses voyages, ses découvertes, l'attribution de son nom a l'Amérique, ses relations authentiques et contestées.** ix and 421 pp.; index. (Recueil de Voyages et de Documents pour servir a l'histoire de la géographie.) Ernest Leroux, Paris, 1917.

WATSON, FOSTER. **Richard Hakluyt: A pioneer of colonisation.** *United Empire*, Vol. 8 (N. S.), 1917, No. 4, pp. 225-238 (discussion, pp. 237-238).